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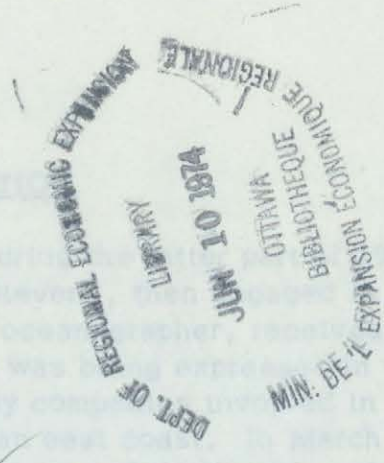
SUMMARY REPORT ON ESTABLISHING AN ENVIRONMENTAL SUPPORT SERVICE FOR THE OFFSHORE OIL INDUSTRY



SUMMARY REPORT ON ESTABLISHING

AN ENVIRONMENTAL SUPPORT SERVICE FOR THE OFFSHORE OIL INDUSTRY

ON THE CANADIAN ATLANTIC COAST

Prepared under contract to the

Minister of Regional Economic Expansion

on behalf of HER MAJESTY THE QUEEN IN RIGHT OF CANADA

by

OCEAN SCIENCE ASSOCIATES LIMITED

Suite 215, Duke Street Tower

Scotia Square, Halifax, Nova Scotia

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INTRODUCTION

During the latter part of 1970 and early 1971, Dr. R.G. Stevens, then engaged in private practice as a consulting oceanographer, received several reports that an interest was being expressed in weather and wave forecasts by companies involved in oil exploration off the Canadian east coast. In March 1971, Mr. M.R. Morgan, officer-in-charge of the Canadian Maritime Forces Weather Centre, agreed to advise Dr. Stevens in organizing a private environmental forecasting service. This service constituted one of several capabilities to be offered by Ocean Science Associates Limited which company was then in the process of organization.

Exploratory conversations with representatives of the oil companies and drilling rig operators produced a bewildering variety of immediate and projected requirements for environmental support services. In addition, there seemed to be some uncertainty as to whether or not the services in support of the offshore oil industry should be provided by the public meteorological service. These questions and confusions were somewhat resolved during a meeting at which oil company representatives expressed their needs to the Canadian Meteorological Service, since renamed the Canadian Atmospheric Environmental Service (CAES).

MARKET ANALYSIS

As a result of the meeting held in Halifax, N.S. in March 1971 bringing together the representatives of the petroleum industry and of the Canadian Meteorological Service, a set of requirements for environmental support to the offshore oil industry was compiled. In assessing these specific requirements and following informal discussions with some of the personnel actively engaged in the offshore oil exploration, it was considered by Mr. Morgan and Dr. Stevens that the requirements for that industry could only be met by establishing a dedicated environmental support service along the lines maintained by the military in support of their naval operations. The service was envisioned to include weather and wave advisories prepared by marine meteorologists experienced in providing environmental support to Maritime air, surface and sub-surface operations. These advisories would be tailored to the specific requirements of the industry and communicated by person to person briefings, wherever practicable, or by wire facsimile. In addition, the proposed environmental support service would include consultation by experienced mariners and engineers who would assist the operators in developing procedures to respond to extreme weather conditions and would also advise on the operation of logistic support vessels and aircraft in order to achieve a cost-effective operation. The service would also include research activities directed toward the improvement of forecasting, the compilation of climatic data, the introduction of new techniques for the operational deployment of logistics and drilling vessels. It was envisioned that the service would become an almost integral part of the oil exploration and production operations as rapport developed between the environmentalists and the operators.

The requirement for extensive services such as these for offshore drilling has been found to be both necessary and worthwhile elsewhere in the world. For the Gulf of Mexico, A.H. Glenn Associates and other private U.S. environmental consultants have been operating for many years, as also have the British company IMCOS in the Persian Gulf. The precedent has, therefore, already been established elsewhere that the oil industry requires more support offshore than a government meteorological service can, or should, be expected to provide. The extremely variable conditions of the eastern Canadian coast, compared to the Gulf of Mexico, emphasize the validity of the thesis that the exploitation of the Canadian continental shelf by oil companies cannot continue for long without a customized service being established.

On the other hand, it was realized that the present level of activity in eastern Canadian waters is rather minor compared to the other areas of oil exploration. Nonetheless, it was felt that in order to prepare for anticipated future expansion of both exploration and production operations it would be wise to establish a comprehensive environmental service at this time in order to gain operating experience before the need became critical. The proposed service included a meteorological staff of six persons composed of the senior meteorologist, two meteorologists and three meteorological technicians, all experienced with local weather on the Canadian east coast plus having substantial marine or sea experience. In addition, consultant services from experienced mariners, engineers and meteorological and oceanographic scientists would be provided at no extra cost. The entire cost of communications, both with the Canadian Meteorological Service and with the operators is included in the subscription fee. This provision was deemed essential in order to avoid reduction of the effectiveness of the service as a result of attempts by individual operators to achieve economies by minimizing the use of communication facilities. The cost for this comprehensive environmental advisory service was estimated at approximately $200,000 for the first year of operation, although economies might be realized which could be reflected in a reduction of the second year cost.

It should be pointed out at this juncture that the proposed service would compliment and extend and not conflict in any way with the service provided by the Canadian Atmospheric Environmental Service. This understanding emerged clearly in discussion with Mr. Roy Lee, Head of Forecasting Service, during Dr. Stevens' visit to the CAES headquarters in Toronto in June of this year. It was also made apparent during the meeting that the CAES recognized the need for private Canadian enterprise to be engaged in this field otherwise non-Canadian companies would soon be established in the Atlantic Provinces. The co-operative spirit of the CAES has subsequently been demonstrated by their expeditious response to the request by Ocean Science Associates to provide facsimile and teletype data services.

In considering the cost-effectiveness of the proposed environmental support service, it was suggested that if the expense was shared by four operating companies, the total annual cost to each company would be equivalent to approximately one day's operation of a large offshore drilling rig. It is almost a certainty that this much of a saving could actually be realized every year by each and every company operating off the eastern Canadian coast. Admittedly, comparable savings might be achieved with a lesser service but in view of the potential future economies to be achieved in the operation of the logistics support fleet and in preparing for production facilities, it was felt that the cost would be self-justifying. Consequently, a preliminary proposal outlining these and other considerations was prepared and submitted for discussion with Shell Canada Limited and Mobil Oil Canada Limited located in the Halifax-Dartmouth area, plus Amoco Canada Petroleum Company Limited and Tenneco Oil and Minerals Limited, located in St. John's, Newfoundland. Discussions with representatives of these companies proved confusing and indecisive because of the tentative nature of their operating programs and the sometimes diffuse authority for decision making within the various companies. While the general consensus expressed during meetings was that an environmental advisory service of some type was required there was little enthusiasm for the extensive service which we proposed to meet the companies' previously stated requirements. In addition, both Shell and Amoco, the two most active exploration companies, had already engaged the service of the Institute for Storm Research based in Houston, Texas, primarily to provide advisories on severe storms. It was our belief that the reluctance to perceive the virtues of a full fledged environmental service was partly due to the short range economic outlook of those charged with the conduct of field operations. In no case did we get the impression that the local office would actually be in a position to make a final decision. We therefore decided to prepare a second, somewhat abbreviated, proposal for discussion with the East Coast Petroleum Operators Association (EPOA) which organization is based in Calgary and was presumed to provide a mechanism by which long term shared cost programs of interest to several companies could be negotiated. This proposal, along with the preliminary proposal, are included as Appendices A and B of this report.

We were invited to present a proposal to the East Coast Petroleum Operators Association in Calgary on June 21, 1971. The proposal was presented by Dr. Stevens and Mr. Cartwright while an accompanying weather and wave briefing was presented by Mr. David Strang since Mr. Morgan was unable to attend for that purpose. The outcome of this presentation was a serious disappointment to us because the EPOA representatives were in no case able to speak for 'management' of their companies and we were given the impression that our presentation was considered to be in the form of a background presentation or seminar. Since it was apparent that no action would be forthcoming from the EPOA as a group, we undertook to present our proposal to more senior management of each of the operating companies. The result of this exercise was the discovery that there was practically no appreciation for the effect of weather on offshore operations on the part of these people who were accustomed only to operations on land. Secondly, we found rather little enthusiasm for the entire east coast exploration activity, management having apparently relegated it to a rather secondary role. Thirdly, we discovered that most companies had no long range operating plan and appeared to be proceeding on an almost seasonal basis in the conduct of their operations. Fourthly, while almost all of the managers expressed an interest and desire to participate in joint activities, they felt that the prospects for actually achieving such co-operation were very dim indeed. As a last, somewhat desperate, measure we prepared a circular letter for the consideration of the operating companies requesting that they indicate their willingness to accept our services during the period during which we supposed that they would be conducting explorations. We found that some companies were not prepared to commit themselves even nine months ahead of the commencement of operations while others intimated that they would consider subscribing to our service if it were in fact a service in being. One company intimated that even though they were not presently active in exploration, they would seriously consider supporting our service in order that it would be in existence when required by them. This latter company, however, objected to the cost of our service in comparison with other existing services. One or two other companies also raised the question of cost and in no case did

we seem to make any impression with the fact that we were offering complete environmental support as compared to a limited weather forecasting service.

As a result of these discussions and because of the somewhat desultory pace of exploration activities on the Canadian east coast at this time, we have concluded that, in order for a Canadian company to establish itself in this field at all, it will be necessary to begin with a much less sophisticated and refined service than was originally envisaged. We believe that our original considerations were valid and that because of the severe nature of weather and wave conditions on the Canadian east coast a full fledged environmental support service will eventually be required. However, in the interim we propose that the service outlined below will meet those requirements which the oil companies have expressed to us as being essential although there is a disparity between these requirements and those given to the Canadian Meteorological Service.

COMPANY ORGANIZATION, DATA AND COMMUNICATION REQUIREMENTS

THE SERVICE:

Daily Forecasts:	Weather: 5-day outlook 12-hour, 24-hour and 48-hour forecasts
	Waves: 12-hour, 24-hour and 36-hour forecasts
Severe weather:	During approach of storms or other severe weather and wave conditions, hourly advisories will be issued and, if desired by the operator, direct communication with drilling rigs, logistics support vessels and aircraft will be established.
Format:	Routine forecasts will be prepared in easily readable actionable format for transmission by Xerox facsimile to operator's office or drilling site. Forecasts will include surface visibility, aircraft visibility, ceiling and icing conditions plus surface vessel superstructure icing warnings. Special advisories may be transmitted by teletype and/or telephone.

COMMUNICATIONS

Incoming Data:

1. Teletype circuit and receive-only equipment for Canadian Atmospheric Environmental Service circuits 180 and 181 to provide hourly observations from Canadian, United States and marine weather observing stations.*

2. Facsimile circuit 1801/1835 and terminal equipment to provide weather and wave prognostic charts. *

* Permission must be granted by the Deputy Minister CAES for use of these circuits.

COMMUNICATIONS (Continued)

3. Telex terminal to receive data from oil drilling rigs. (Schedule to be arranged with participating companies).

Outgoing Data:

1. Xerox facsimile transmitter with telephone handset for transmission of routine forecasts.

2. Telex transmitter for transmission of special advisories.

3. Datacom or Voicecom telephone circuit to St. John's, Newfoundland, to provide direct service to client's offices located in that city when required.

4. As in (3) above to Georgetown, Prince Edward Island.

5. Terminal equipment located in client's office to provide voice radio/telephone patch using client's radio circuit to drilling rigs.

PERSONNEL

For any pilot scheme project the staff will consist of off-duty meteorologists regularly employed by the Canadian government weather services in the Halifax area. For the longer term it is intended to recruit qualified personnel on a permanent basis from Canada, USA or Europe as may be necessary.

It is hoped that, with the retirement age in the Public Service now reduced to 55 years, some very experienced personnel will be interested in accepting this challenge and find the remuneration attractive, such that the majority of personnel, if not all, will be Canadian.

FACILITIES

Office space in a centralized location in the Halifax-Dartmouth area to consist of at least 450 square feet of usable floor area. Provision to be made to house teletype equipment in soundproof enclosure. A standard meteorological light table and stool plus a six-drawer chart case to be included in the furnishings. A large wall chart of the Scotian Shelf, Grand Banks and Labrador Sea to be provided on which the location of drilling rigs can be clearly indicated along with status boards and the usual handy reference files of current meteorological reports.

FINANCIAL REQUIREMENTS

Capital requirements for establishing this limited environmental forecasting service are estimated at approximately $7,000, of which somewhat more than $4,000 is assigned to promotion costs while slightly over $2,000 would be required for fixed furnishings, alterations and equipment installation.

In order to estimate total capital requirements a Monthly Operating Cost Estimate, and a Projected Exploration Activity chart were prepared and used to calculate a Cash Budget Forecast 1971-72, all of which are included in Appendix 'C'. For purposes of estimation a flat monthly fee of $2,500 per company was assumed but this fee might be expected to be increased for companies operating more than one drilling rig. Assuming 100% participation by all operators a maximum deficit of $21,000 would be incurred if operation of the service were to commence in October 1971. The maximum deficit would be only $12,500 if operations commenced in January 1972 because of the increased activity starting during the late winter. In general, however, it would be desirable to start the service as early as possible in order to accumulate experience during the severe fall and winter months.

Since full participation by all operators cannot be counted on it would probably be imprudent to capitalize the venture for less than $35,000 which would cover a full six months of operation without revenue.

Nonetheless, with the impending release of data from the first phase of Shell Canada's exploration and the evaluation of the Mobiloil 'wet' well on Sable Island, interest in exploration may very well increase markedly in the future. Activity cannot be increased too suddenly because suitable exploration rigs are not available on the world market. On the other hand, if results to date are found not too promising, exploration can be expected to continue at about its present pace for at least another two years. Consequently, investment of the necessary capital in an Environmental Support Service must be regarded as a speculation that activities will increase in the Canadian Atlantic waters. One other feature should be pointed out, however, which is that provision of basic weather forecasting services may lead to further work of a research nature on other environmental and technical support problems within the capability of the company. Further opportunities exist for extension of forecasting services to include fishing and other marine industries. There is no reason either why private forecasting service to farmers, electric power transmission companies, home heating fuel oil companies, etc., cannot be made profitable in Canada as they are in the U.S., U.K. and other countries. However, because of the specialized local knowledge required in order to make accurate and detailed forecasts there is not much likelihood of extending the services into an export market unless unusual techniques are developed.

ADDITIONAL DATA AND MEASURING SYSTEMS

In connection with the fishing industry it might be noted that if the Canadian vessels in the trawler fleet could be induced to provide regular and reliable weather and wave reports, they could contribute toward a significant improvement in offshore environmental forecasting. It might be possible to induce the trawler operators to make observations and reports partly as a matter of self-interest in improved forecasts for their own use but probably some remuneration would also be required. This could be Federally supported program although there is no reason why a private company, such as the one proposed here, should not be responsible for collecting, collating the individual ship reports and transmitting the summary reports. Other means of data collection intended to improve offshore forecasts such as surveillance aircraft, weather radar and moored data buoys are, comparatively, much more expensive and cannot be recommended without extensive study and careful consideration of their cost-effectiveness.

PERSONNEL AVAILABILITY

One serious problem remains to be discussed and that is the availability of qualified Canadian personnel to staff the proposed organization. There is no question with regard to qualifications of Canadian meteorologists, per se, but there is a dearth of meteorologists in Canada with marine forecasting experience. In fact, in attempting to recruit senior staff for the originally proposed Environmental Support Service no Canadian could be found locally who would consider accepting a position in private industry at this time. Some were deeply involved in expanding their present organizations and to others it was completely foreign and apparently considered somewhat unethical to participate in private practice. The overriding concern, however, once the problems had been talked out, was the loss of security. Even young men, under 30 years of age, seemed overwhelmingly devoted to preserving their civil service position with its guaranteed pay, pension and fringe benefits and would not consider leaving the employ of the Federal government although they were most interested in working for private industry as a spare time occupation. This attitude seemed to the writers to be a clear expression of the effect of the welfare state philosophy with which these men have been imbued since they were first subsidized by the government as second year college students. This seems particularly inappropriate and undesirable for a 'frontier land' such as Canada where the private sector has hardly begun to develop, for scientific support services to be virtually government controlled. For instance, so far as we can determine there are only two private meteorological consultant agencies in all of Canada so that aside from the few meteorologists employed by these agencies the products of the three universities who train meteorologists (Toronto, McGill and Alberta) must seek employment in government or in the universities themselves.

A clear recommendation which follows from these findings is that some mechanism be found to induce experienced professionals - probably in other fields as well as meteorology - to leave the Federal Public Service. Alternatively, there should be arrangements whereby civil servants might be hired by private industry or on loan service. In some cases, of course, inexperienced new graduates could probably be recruited but in order to assure an efflux of experienced people into the private sector some provision for a 'portable pension' might well be considered. In the meantime, if it became necessary to staff an organization such as was first conceived to meet the needs of the offshore oil industry, there would seem to be no recourse but to recruit foreign professionals.

It should be added that the same consideration does not apply to meteorological technicians since there is the normal attrition of trained technicians, leaving the military services, looking for employment in civil life outside the Government service.

SUMMARY AND CONCLUSIONS

In conclusion, then, there are three problems which remain to be solved before a Canadian company can provide environmental forecasting services to the offshore oil exploration industry. These problems are :

(a) Commitment of venture capital,

(b) Recruitment of professional Canadian personnel,

(c) Persuading the oil companies to accept the proferred service.

The capital requirement of $35,000 is not very large but it must be recognized that the venture is a speculative one depending primarily on the possible expansion of offshore oil exploration activity in order to realize any substantial appreciation of the investment. However, even if the oil exploration industry does not expand, the investment can be protected by a vigorous and aggressive management willing to exploit the absolutely untouched field of private weather forecasting in all of Canada. Furthermore, if the company is able to get the business of the offshore oil exploration industry it can exploit its position by providing other services of an environmental nature, such as oceanographic surveys, sub-bottom surveys, installation and servicing of meteorological instruments, specialized wave measurements and general climatic studies, all of which are of interest to the oil industry.

So far as professional personnel are concerned, it may be that after sufficient exposure to the world of private enterprise in a part-time position, some of the professional meteorologists may be induced to try a new and exciting career. If this eventuality

fails to materialize it would be necessary to recruit the senior meteorological staff from abroad. However, it might be possible to employ one or more recent graduates from Canadian universities as trainees, possibly filling the technician billets until such time as they were competent as forecasters.

So far as being able to compete for the business of the oil companies is concerned there is a genuine bias on the part of both Canadian and American employees of the oil industry to favour Canadian, and particularly local, industry in providing services such as those discussed here. However, the companies will require a high standard of performance and they do not wish to be responsible for (and the sole means of support of) such a company. It is believed that the revised and reduced environmental forecasting service will be competitively priced if it can be offered to two companies operating on a year-round basis at $2,500 a month each.

APPENDIX A

ENVIRONMENTAL FORECASTING SERVICES

for the

OFFSHORE OIL EXPLORATION AND PRODUCTION INDUSTRY

A Preliminary Proposal

OCEAN SCIENCE ASSOCIATES LIMITED

Suite 215, Duke Street Tower

Scotia Square, Halifax, Nova Scotia

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INTRODUCTION

Decision making in the conduct of marine operations may be considered as falling into two main categories:

(a) those involving strategic decisions,

(b) those involving tactical decisions.

The former are in the long or medium time range, from a year or more down to as far as days; the latter usually are medium or short term projects in the order of a few days down to the immediate present.

Strategic decisions involve policy and plans, research and evaluation; whereas tactical decisions are concerned with current operations, deployment of equipment, personnel and vehicles, and general operational efficiency.

Both types of operations are considerably affected by environmental conditions. Strategic operations need to be supported by climatological information, statistical appreciations, including averages, extremes, frequency of occurrence of limiting conditions, etc. Tactical decisions are based on current conditions and extrapolation of these conditions as far into the future as possible. Five days is the acceptable limit of reasonable successful meteorological forecasting at present but some oceanographic parameters can be forecast for longer periods than this.

Environmental support for strategic operations can be carried out by remote organizations with as much skill as a local organization provided that the required data is readily available. The advantages that the local organization has, however, are: Personal contact with the user, ensuring better communication; timeliness, and an opportunity for more in-depth discussion between the operator and the environmentalist. These advantages are quite significant at times, and personalized advice at strategic planning meetings is often more reassuring than pages of statistics from some remote source.

In dealing with tactical aspects, however, a local organization is essential if the fullest support for day-to-day operations is to be obtained. Daily operations often involve spontaneous decision making and therefore necessitate

(a) immediate contact
(b) up-to-date data
(c) complete local knowledge
(d) readily available communication channels
(e) continuous monitoring
(f) reciprocal involvement of operator and environmentalist working as a team.

It is evident from the foregoing that the closer the environmental support organization is to the scene of operation, the more satisfactory the service will be and the more closely the operator will be able to work with the environment instead of continually fighting it. Good strategic planning can forestall potentially disastrous or expensive adventures; good tactics can improve cost effectiveness. The military have been aware of this since World War I, since when most countries or military blocks have created a well organized environmental support service over and above that provided for civil purposes. A number of airlines have their own meteorologist and there are now some shipping companies employing private organizations for optimum ship track routing. Generally speaking, a far better rapport exists between these personalized services and the operator than between the federal meteorological services and the public. This is not due to the personnel being more qualified academically in the case of the former, but more qualified by virtue of involvement with the activities of the team.

Weather Forecasting - National Meteorological Services

In order to make a forecast for any particular area it is necessary to know the status of the weather over a very much larger area. In fact, the modern practice of weather forecasting requires that the status of the weather be known over the entire globe. One of the major functions of the national meteorological services is to maintain numerous observing stations within the national territory and to report the weather observations into an international communication network. At the present time a huge

communication network linking all the nations of the northern hemisphere is being established under the auspices of an agency of the United Nations. When this system is fully operational it will be possible for any nation to gather information on the status of the world's weather continuously. This information can then be plotted and displayed as a series of maps showing the distribution of high and low pressure areas, winds at various altitudes, regions of air mass modification, where cold dry air mixes with warm moist air, and so on. The interpretation of such maps can be greatly enhanced by combining them with photographs taken from weather satellites circling high above the earth. Satellite photographs are particularly useful in detecting incipient storms which form over the oceans and in other areas where observations are sparse.

In order to forecast the future weather distributions a set of fixed rules, based on hydroodynamics, and taking into account the earth's rotation must be applied at each point of the existing weather pattern. This process requires taking into account the interaction between all existing disturbances, the influence of the winds at various elevations and the amount of heat and moisture flow into the air from the earth's surface. For many years this sort of procedure was carried out by human labor on the part of the meteorologist but the sheer magnitude of the task forced the process to be more of an intuitive application of rules rather than a systematic application of scientific principles. Today, very large and extremely fast electronic computers are used to carry out the point by point, time-step by time-step, projection of the weather into the future. Even the fastest of existing computers cannot handle the problem in its entirety and, in fact, the present observation network does not provide information concerning the flow of energy - in the form of heat and water vapor - into the air from the earth's surface. In practice, the computer is now used only to project the future movement of the major disturbances at very high altitudes away from the influence of the earth's surface. The neglect of this basic source of energy limits the effectiveness of present forecasting technique very substantially. In effect, the entire forecast model breaks down after about 48 hours. A large international program to be carried out during the 1970's will introduce some of the most important surface energy exchange features into the forecasting process. It is expected that this program may result in extending the effective forecast period to as long as two weeks into the future.

At the present time the results of the computer forecast are transmitted over international communications networks from a few major centres to other national meteorological services. At this point, experienced local or regional meteorologists take over and interpret the forecast taking into account the effects of local topography, bodies of water and so on. The quality of the resultant forecast depends not only on the accuracy of the computer projection but upon the experience and thoroughness of the local meteorologist. Furthermore, it must be recognized that national meteorological services are required to forecast for relatively large regions and must also predict a wide variety of parameters. The city-dweller is concerned with the weather on only a very casual basis. Usually he has to make no more momentous decision than whether or not to carry a raincoat or wear his overcoat. He is thus concerned with temperature and precipitation forecasts. The farmer, on the other hand, has a more than casual interest in precipitation; he is also concerned with hail storm and tornado warnings and frost warnings. Aviators are concerned with surface visibility, upper air winds and turbulence. Marine operators are concerned primarily with surface winds and visibility forecasts. More recently, the national meteorological services have begun to provide sea state, or wave forecasts, for which the prediction problems are quite different than for weather.

Specialized Forecasting and Operational Advisory

While it is evident that the vast communications network, computer facilities, satellite systems and other technological support are vital elements in producing good basic forecasts, these facilities cannot and need not be duplicated by specialized forecasters. The role of the specialized forecaster is twofold:

a) To interpret the area forecast in terms of the particular information of interest to the client,

b) To advise the client in specific detail how the environmental changes will affect his operations.

The specialist forecaster can limit the range of his interests to the particular environmental variables which affect his clients operations and become expert in the subtle ways in which local topography seasonal factors and so on influence the particular variables of interest. Secondly, he can become expert in those aspects of

his clients operation which are especially influenced or controlled by environmental conditions. Thus, by making use of the excellent services and facilities offered by national meteorological organizations the specialist both extends and refines the available environmental information and applies this knowledge as though he were an integral part of the clients operation.

Cost Effectiveness of Specialized Forecasting Services

The most difficult question to answer categorically is the cost effectiveness of an environmental support organization. For instance, it costs Pan-American Airlines millions of dollars a year for environmental support but one cannot say that X number of planes were saved from disaster or Y thousands of extra flying hours were avoided or an aircraft's fatigue limitation was increased by 25% or more. One can say, however, that it only needs one jumbo jet to crash for the lack of adequate weather advisory to make the present cost of $25 millions annually for the Canadian Meteorological Service to appear as a ridiculously small investment. Traveller's Insurance have tried to conduct an evaluation of the cost effectiveness of environmental advisory services and came to the conclusion that there was a minimum of $10 return for every $1 spent. In terms of offshore oil explorations on the Canadian east coast, it would only take a few hours of drilling over the period of one year to show a profit from this investment. The saving of a helicopter or resupply vessel and its crew is hard to justify in terms of cost but the value of the equipment alone is equivalent to several years of the service proposed here. In short, the value of an environmental advisory service can only be assessed when you have a disaster on your hands which can be attributed directly to environmental conditions concerning which you have had no previous advice and were unable to take appropriate action. A good service should result in disasters being avoided, thereby making an assessment of its value something intangible.

TENTATIVE PROPOSAL

for

TACTICAL ENVIRONMENTAL ADVISORY SERVICE

for the

OFFSHORE OIL EXPLORATION AND PRODUCTION INDUSTRY

An environmental advisory organization must contain the following facilities and competence :

(a) data acquisition facility
(b) data processing capability
(c) analytical and prognostic competence
(d) operational interpretation competence
(e) advisory presentation facility
(f) research and development capability

Ocean Science Associates propose to provide a tactical environmental advisory service to meet the needs of operators engaged in offshore oil explorations and production on the Canadian Atlantic seaboard. A preliminary and tentative description of facilities and services is described below. However, in the event that the proposed services diverge from the needs as recognized by the oil industry or its operators, Ocean Science Associates Limited will be pleased to amend or extend the provisions of this document.

I Environmental Operations Center

Ocean Science Associates propose to establish and maintain an Environmental Operations Center which will be staffed and operated on a continuous 24 hour basis.

A Services and Function

The primary function of the Environmental Operations Center is to (1) evaluate, amend and extend the weather and wave information services provided by the Canadian Meteorological Service and U.S. Government agencies ; (2) interpret the forecast information as to its particular effect on the known operations planned or in progress of each subscriber; (3) issue timely advisories to each subscriber as set out under Presentation below :

1 Information Collection and Processing

For purposes of the private forecaster there is no need to duplicate the national and international observing network since this data may be purchased from the government services. In fact, there is no necessity for reproducing either the numerical or local weather forecasts since these too are transmitted over accessible communication networks. Both the basic observational data and the forecasts may then be considered to be part of the data available to the Environmental Operations Center. In addition, however, since the national network does not extend beyond the coastline it is essential that arrangements be made to transmit regular observations from all available drilling platforms to the Environmental Operations Center. This data is not only of the utmost value in preparing forecasts but it is also extremely valuable for verifying forecasts in order to improve forecasting techniques.

2 Evaluation and Interpretation

While the basic weather and wave forecasts generated by the national weather services are of utmost value and usually quite reliable the interpretation of these forecasts , so far as it relates to a specialized activity, such as oil well drilling, is not a straight forward process. For example, a severe storm approaching the Scotian Shelf may be forecast to pass well to seaward of the operating area. From the standpoint of the regional forecaster this may be the most probable course of events and the forecast may, in fact, be reliable. On the other hand, from the point of view of

the marine operator the essential point may be that if the storm does enter into the operating area it would interrupt a delicate operation posing a serious hazard to men and potential damage to equipment. Therefore, although he probability of the storm passage over the operating area may be small the Environmental Operations Center must issue suitable warning and advise the operator to take appropriate precautions. Furthermore, by continuously following the progress of the storm the forecaster may issue an immediate advisory when all danger from the storm is passed allowing operations to be resumed. The example illustrates the necessity for the forecaster to be thoroughly familiar with marine operations and the importance of his being appraised of the present status of such operations.

Wave forecasting presents a somewhat different problem since it is not, at this time, as highly developed a technique as is weather forecasting. Computer generated wave forecasts for the entire North Atlantic Ocean are available from the U.S. Government. However, for reasons which cannot be discussed in detail here, numerical wave forecasts are inherently unreliable in their present state of development and are essentially useless for operational purposes near the Canadian coastline. The Canadian Meteorological Service will undertake to furnish wave forecast in the near future which, although based on subjective analysis, promise to be more appropriate for the needs of the offshore oil industry. However, it must be recognized again that although the forecasts will be generated for the Scotian Shelf and Grand Banks area considerable refinement and interpretation of the forecast is necessary before it can be applied to particular sites and particular operating conditions.

3 Advisory Presentation

The bridge between the environmental forecaster and the operator may be provided by a variety of communications techniques any or all of which will be provided by Ocean Science Associates at the subscribers request.

a) Status Board - A display board containing color coded symbols indicating the status of Environmental Operating Procedures under existing and forecast conditions may be maintained in the subscribers operations office on board drilling platforms at logistic support bases, etc. Arrangements may be made to update the status board by telephone, Telex, facsimile or other means of communication.

b) Verbal Briefing - A verbal briefing consisting of a revised 5 day outlook plus 12, 24 and 48 hour forecasts will be available twice a day. Subscribers having offices in the Halifax-Dartmouth area may elect to receive a personal briefing in their office or by telephone. Other subscribers may receive telephone briefings supplemented with facsimile transmissions. Subscribers are urged to take advantage of the verbal briefing schedule to advise the briefing officer of the present status and future intentions of both logistic support and drilling operations.

c) Direct Communication - Provision should be made, but at the subscribers discretion, for direct communications between the Environmental Operations Center and operating sites or vehicles. This will permit the forecaster to enter into direct conversation with operators during emergency situations, to verify questionable environmental observations from drilling platforms and to discuss operational problems.

B Equipment

The Environmental Operations Center will be equipped with the usual furnishings of a first class meteorological forecasting office including :

1) Teletype printers (1 or more as necessary)
2) Facsimile receivers (1 or more as necessary)
3) Interface equipment and receivers necessary to receive observational data and forecast information from the Canadian Meteorological Service and U.S. Weather Bureau
4) Equipment to receive and record observational data from drilling platforms
5) Equipment for direct communications with drilling platforms if feasible and desired by the subscriber.

C Staff Qualifications

Adviser in Environmental Forecasting Services

Cdr. M.R. Morgan, R.C.N. (Ret'd.) B.Sc. B.Ed. F.R.Met.S. brings to the company over 30 years of experience in the provision of environmental support services for marine operations - 20 years with the British Navy and 12 years with the Canadian forces. Originally trained as a Navigation Specialist in 1939, Cdr. Morgan became a meteorological specialist in 1945 and cross-trained in operational oceanography in 1960. He has considerable forecasting experience both ashore and afloat in the North Atlantic including 15 years of experience providing environmental support for marine, air and surface operations in the Canadian Atlantic. He has published a number of papers of international standing in marine meteorology and has served on international committees on environmental problems.

Meteorologist Staff

Accredited meteorologist graduates of North American or European universities in physics and mathematics with post graduate training in meteorology and oceanography. A wide experience in forecasting for air and sea operations with at least three years experience in the Canadian Atlantic area.

Meteorological Technician Staff

Skilled meteorological tradesmen trained by accredited meteorological seniors in observing, equipment installation and calibration, and communications. Experienced in meteorological briefing from products prepared by professional meteorologists and in the provision of these services to air or surface marine operators.

II Environmental Operating Procedure

Ocean Science Associates proposes to establish, in consultation with each subscriber, a series of Environmental Operating Procedures which delineate the specific actions or continuing measures to be carried out by drilling platform operators and logistic support operators in response to certain special wave or weather advisories. The purpose of the Environmental Operating Procedures is to ensure that the primary mission; that is, drilling operations, are extended as long as possible in the face of adverse weather and wave conditions by curtailing non-essential activities and taking cautionary measures in advance. The operating procedures will be keyed to certain environmental criteria such as those listed in Appendix A and a sequence of code designations will be adopted to indicate which Environmental Operating Procedures are in effect.

Implementation of Environmental Operating Procedures will result not only in improved efficiency in the drilling operations due to a smoother transition under storm conditions but will also reduce the need for lengthy communication when issuing weather advisories. Furthermore, using the experience of commercial and military marine operations as a guide, it should be possible to effect real economies in the operation of logistic support vessels and helicopters. Finally, by establishing a fixed response to forecast conditions it becomes possible to evaluate the effectiveness of the environmental advisory service more objectively and to isolate area where improvements can be made. In the long run such objective evaluations may be used to implement further refinements. In particular, application of Operations Analysis and Decision Making Theory (discussed below under Section III Research and Development) offer great promise for long term improvements in operating efficiency.

III Research and Development

Ocean Science Associates undertakes to maintain a competence for research in several areas relevant to the environmental forecasting services which they provide.

A Wave Forecasting

The present status of wave forecasting technique is markedly inferior to weather forecasting even though in essence wave forecasts should be simpler to make and more predictable because the propogation characteristics of waves. One of the reasons for the present deficiency is a lack of fundamental knowledge about the mechanics of real waves but studies in this area are very expensive to support. However, another difficulty, and one which is more pertinent to forecasting, is the lack of reliable and consistent, basic wave observations from which to make predictions. It should be possible to make substantial improvements in wave forecasts for the areas in which drilling platforms are located by making use of the platforms as observing sites. Thus the forecast and actual wave conditions may be compared over a period of time in order to make empirical corrections to the forecasting method. Ocean Science Associates will make immediate use of this unique opportunity to develop an improved empirical forecasting technique and will implement improvements in operational forecasts as soon as they become available.

Ocean Science Associates are particularly competent to conduct such research because of the extensive experience in fundamental and applied wave research possessed by some of the senior staff.

B Operations Research and Decision Theory

Operations Research and Decision Theory are mathematical techniques which are ideally adapted to evaluation of complex practical problems such as arise in marine operations.

The application of these techniques requires that basic data be collected which describes the environmental conditions as they actually exist versus the forecast conditions and the effect which these conditions have on operations. Ocean Science Associates will undertake to compile this data in collaboration with the subscribers and will, after sufficient data is collected, prepare recommendations for further analytical research if the data appears to warrant application of Operations Research or Decision Theory techniques.

C Climatic and Synoptic Studies

Environmental factors which affect strategic decisions, such as the feasibility of conducting exploration operations in sub-artic areas, must usually be gleaned from data which was accumulated for entirely different purposes. Ocean Science Associates are thoroughly cognizant of the various sources of such data and have an unusual degree of competence in the evaluation and presentation of summary information. This service will be made available to subscribers on an individual or group basis by separate contract agreements.

IV Tentative Schedule of Costs

Ocean Science Associates proposes that cost sharing by two or more subscribers to the tactical environmental advisory service proposed here will help to ensure the cost-effectiveness of the service. It is, indeed, realistic to assume that subscribers will realize an actual economy in operating costs by implementing this proposal as can be seen by examining the schedule below :

Number of Subscribers	Monthly Cost Per Subscriber	Annual Cost Per Subscriber	
2	$5750	$71,500	(48)
3	4675	56,100	(37)
4	4000	48,000	(32)
5	3125	38,500	(26)

Figures in parenthesis indicate the equivalent number of hours drilling, calculated at $1500/hour which if saved during the course of a year, due to this service, would make the service self sustaining. In fact, however, additional real economies can be realized in logistic support operations.

The subscription service includes all items described under Section I and Section II except for: equipment and support service for environmental observations on drilling platforms; radio transmission equipment (but including remote terminal) and facsimile communication equipment. Most of these items are presumed to be already available. Facsimile equipment can be leased at modest additional cost. Results of research activities in wave forecast improvement will be implemented as and when available at no extra cost. Proposals for exploiting the benefits of Operations Analysis and Decision Making Theory will be presented for the consideration of subscribers as an additional activity. Climatic studies and environmental surveys will be proposed in response to requests from one or more subscribers.

APPENDIX B

PROPOSAL TO EPOA

for

ENVIRONMENTAL FORECASTING

SERVICES

OCEAN SCIENCE ASSOCIATES LIMITED

Suite 215, Duke Street Tower

Scotia Square, Halifax, Nova Scotia

July 1971

PROPOSED ENVIRONMENTAL FORECASTING SERVICES

FOR THE

OFFSHORE OIL EXPLORATION AND PRODUCTION INDUSTRY

BACKGROUND

During March of this year, representatives of several petroleum companies met with representatives of the Canadian Meteorological Service in Moncton, New Brunswick, for a detailed discussion of the requirement for environmental forecasting to offshore exploration activities on the Canadian east coast. Of particular concern to the operators was the apparent lack of detail in the forecast of wind and sea states in the offshore areas. While wind strength and direction forecasts are included in the six-hourly government meteorological service marine area weather summaries, only sparse information on sea state is included. It was, therefore, the general consensus of the meeting that information provided by the government service was not specific enough to meet the requirement of the operators. Since the meeting, it has been ascertained that there is very little likelihood of additional information being provided from government sources although some wave forecasts will be undertaken in the future. The current situation has led two of the four companies presently operating offshore to subscribe to a research-oriented advisory service provided by an organization located in Houston, Texas.

Against this background, Ocean Science Associates feels that there is a requirement for an operator-oriented environmental forecasting service on the east coast manned by personnel with extensive local

forecasting experience. In early February 1971, Ocean Science Associates began an investigation of several aspects of private meterological services including the availability and qualifications of meteorologists with local forecasting experience who have also had substantial experience at sea. The results of this investigation indicate that a core of highly qualified, mature and experienced environmental forecasters is available and interested in the prospects and challenges presented by operational forecasting for the offshore oil industry and that private forecasting services, although not now extant in Canada, are technically and financially feasible. In June 1971 a tentative proposal for environmental forecasting services was prepared for consideration by local offices of the four companies now carrying out exploration in the area: Shell, Mobil, Amoco and Tenneco. Discussions with the local representatives revealed the following facts:

1. All agreed with the requirement for a private environmental forecasting service to augment forecasts currently received from government sources.
2. One company using the services of the Houston-based organization was satisfied with their service although they had only operated in relatively good weather since commencing operations in April of this year. The other company was not completely satisfied with the services rendered.
3. The requirement for environmental forecasting services varied, i.e.:
   (a) One company operating off Labrador could only operate from June to October because of ice.

(b) One company might not desire to continue operations during the winter months.

(c) One company would require maximum support during the winter months.

4. All companies indicated a preference to deal with a local organization to provide forecasting services, if one were available.

As a result of these discussions, Ocean Science Asscoiates became convinced that an environmental forecasting service should be established now on the Canadian east coast to support offshore oil exploration, not only to meet current requirements but also to ensure that an adequate service is available to support the industry as activities are increased in the future. A decision was made, therefore, that every effort should be bent toward commencing operations of the environmental forecast service by early September. There are a variety of compelling reasons for this decision, some of which are:

(1) The undeniable need of offshore operators to be well advised on environmental situations during the fall hurricane and storm season.

(2) The immediate availability of highly qualified and experienced forecasters whose services might not be available in future.

(3) The state of readiness of the company organization to implement plans which had been carefully formulated over the past several months.

FACILITIES

An Environmental Operations Central will be established in the Halifax-Dartmouth area and will serve as the forecasting, communications and research centre for the Atlantic coast, Gulf of St. Lawrence, Labrador Sea and Hudson Bay area. This facility will be equipped with teletype and facsimile equipment to receive data and forecast information from the Canadian Atmospheric Environment Services as well as U.S. Weather Bureau services. In addition, direct communication lines with St. John's, Newfoundland, will be maintained for use of those operators whose headquarters are based in that city. Teletype and Xerox facsimile transceiver facilities will also be installed. Provision will be made, at the discretion of the operators, for direct telephone-radio telephone communication with drilling rigs and logistics support vessels.

Emphasis is laid on a substantial communication network since direct and continuing communication between the environmentalist and the operators is looked upon as an essential feature of our service. It may be expected that, as civil aviation and military experience has proven, a certain rapport will be developed between the operators and the environmentalist so that eventually the environmental services become a truly integrated part of the operations team.

FORECASTS

Ocean Science Associates will issue routine, twice-daily forecasts including an updated five-day outlook plus 48-, 24- and 12-hour forecasts. During periods when severe weather or wave conditions may be expected,

hourly advisories will be issued. During critical operations or, as desired by the operator, direct communication to drilling rigs and support vessels will be established. Users of the service are urged to avail themselves of the opportunity during the twice-daily routine forecasts to advise the forecaster of the status of present operations and plans for future operations. In this way, forecasters will be made aware of the operations planned or in progress. Advisories and forecasts issued to each operator will be tailored to the specific location of drilling equipment and will take into account the particular activities in which the operator is engaged.

ENVIRONMENTAL OPERATING PROCEDURES

As a part of its environmental services Ocean Science Associates offers the services of its senior staff members who will upon request consult with individual operators in order to establish a series of Environmental Operating Procedures. The purpose of these procedures is to delineate the specific actions or continuing measures to be carried out by drilling platform operators and logistic support operators. The intent of the Environmental Operating Procedures is to ensure that the primary mission, that is, drilling operations, are extended as long as possible in the face of adverse weather and wave conditions by curtailing non-essential activities and taking cautionary measures in advance. The operating procedures will be keyed to certain environmental criteria such as those listed in Appendix A and a sequence of code designations will be adopted to indicate which Environmental Operating Procedures are in effect.

Implementation of Environmental Operating Procedures will result not only in improved efficiency in the drilling operations due to a smoother transition under storm conditions but will also reduce the need for lengthy communication when issuing weather advisories. Furthermore, using the experience of commercial and military marine operations as a guide, it should be possible to effect real economies in the operation of logistic support vessels and helicopters. Finally, by establishing a fixed response to forecast conditions it becomes possible to evaluate the effectiveness of the environmental advisory service more objectively and to isolate areas where improvements can be made. In the long run such objective evaluations may be used to implement further refinements. In particular, application of Operations Analysis and Decision Making Theory offer great promise for long term improvements in operating efficiency.

RESEARCH

Climatological

Compilation and collation of statistical information for both waves and weather will be carried out as a standard part of our continuing effort to improve forecasting techniques. Specialized climatological studies covering specific operating areas or problems will be conducted on request of individual or groups of operators under separate contract agreements.

Wave Forecasting

Ocean Science Associates possesses a considerable competence in wave forecasting as the subject has been a research specialty of

Dr. R.G. Stevens for over 15 years and the Canadian wave forecasting program has been developed under the direction of Commander M.R. Morgan, our environmental consultant. Considerable emphasis will be placed on improvement in forecasting reliability in cooperation with various Canadian government agencies. In addition, consideration is being given to a contractual arrangement to retain the support of a research-oriented institution which has had considerable experience in environmental studies in the Canadian Atlantic region.

Operations Research and Decision Theory

Operations Research and Decision Theory are mathematical techniques which are ideally adapted to evaluation of complex practical problems such as arise in marine operations. The application of these techniques requires that basic data be collected which describes the environmental conditions as they actually exist versus the forecast conditions and the effect which these conditions have on operations. Ocean Science Associates will undertake to compile this data in collaboration with the subscribers and will, after sufficient data is collected, prepare recommendations for further analytical research if the results appear to warrant application of Operations Research or Decision Theory techniques.

REMUNERATION

Initially, the possibility was considered of billing each subscribing company on a monthly basis for the intended service, but because of varying usage requirements by companies, this method of payment is neither

desirable nor feasible. As an alternative, and in recognition of the fact that the service to be created will be available to all east coast operators when engaged in exploration or production, there is a strong case for this common support service for the industry to be contracted and paid for by the East Coast Petroleum Operators Association. The total cost for organizing and providing the service described above for the first year has been estimated at $240,000. This price is based on the assumption that senior and experienced meteorologists and meteorological technicians will be employed throughout; that first class facilities including the best available telecommunications are to be utilized; and that current data analysis techniques, including computers where required, will be employed. The preferred method of payment would be quarterly payment in advance commencing 1 October 1971.

CONTRACTUAL ARRANGEMENTS

Further description of the services to be rendered will be provided for inclusion in any contract drawn up by the Association's legal representatives.

It is requested that this proposal be considered by the East Coast Petroleum Operators Association at an early date and a decision be rendered prior to 19 August 1971.

Raymond G. Stevens

Raymond G. Stevens, Ph.D.
President
Ocean Science Associates Ltd.

APPENDIX AA

Parameters Affecting Oil-Drilling Operation

These specifications were stated by all oil company representatives in March, 1971 in Halifax to be :

Activity	Critical Condition
1. Haul up anchors	Waves less than 8 feet for 9 hours
2. Moving rig	Waves less than 10 feet
3. Drilling	Waves over 30 feet, periods over 18 seconds
4. Helicopter operations	Winds over 45 mph, icing conditions
5. Disconnect drill	Waves less than 40 feet
6. Reconnect drill	Waves less than 15 feet
7. Seismic work	Waves less than 10 feet
8. Production testing	Waves less than 20 feet, periods less than 10 seconds
9. Resupply boat work	Waves less than 10 feet

There are other parameters which are considered pertinent to the operation in the following ways: (a) visibility affects air operations and evacuation of personnel, (b) temperature and humidity affects equipment and personnel output, (c) sea temperature affects underwater operations, survival at sea, production testing, (d) icing affects air operations, rig stability, equipment and personnel performance, (e) bottom topography and type affects holding ground, (f) currents affect maintenance of station.

APPENDIX C

OCEAN SCIENCE ASSOCIATES LIMITED

REDUCED ENVIRONMENTAL SUPPORT SERVICE

MONTHLY OPERATING COST ESTIMATE

1.	Operating Costs		
	Forecasting office rental (approx. 500 sq. ft.)	$200	
	Communications		
	1) Xerox facsimile - 1 2) Model AR35 T/P - 2 3) Mufax facsimile - 1		
	Telephone service (basic local service only)		
	Paper supplies	800	
	Salaries	3,000	
		$4,000	$4,000
2.	Management Overhead		
	Executive office rental		
	Secretarial Service		
	Telephone		
	Transportation		
	Promotion		
	Salaries	1,270	1,270
Basic Monthly Operating Cost			$5,270

Additional cost for St. John's, Newfoundland, or Georgetown, P.E.I.:
Datacom service @ $270 each/month;
Salary increment for more than three customers @ $300/month

PROJECTED EXPLORATION ACTIVITY

CANADIAN EAST COAST OFFSHORE OIL INDUSTRY

	1971 O	N	D	1972 J	F	M	A	M	J	J	A	S	O	N	D
Shell (2 rigs)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
(or sublessees)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Amoco	x	x			x	x	x	x	x	x	x	x	x	x	x
(or sublessees)															
Mobil												x	x	x	x
Tenneco									x	x	x	x			
Hudson Bay O & G								x	x	x	x	x	x	x	
	3	3	2	2	3	3	3	4	5	5	5	6	5	5	4

(58)

OCEAN SCIENCE ASSOCIATES LIMITED

Reduced Environmental Support Service

Cash Budget Forecast 1971-72
in $ - Cents Omitted

	No. 1 Basis				No. 2 Basis commencing operation January 1972			
1971	Expenditure	Revenue	Excess of Expenditure	Revenue	Expenditure	Revenue	Excess of Expenditure	Revenue
Oct 1 - Preliminary expense	$7,000		$ 7,000		$ 7,000		$ 7,000	
Month of October	5,540		12,540					
November	5,540	$ 5,000	13,080					
December	5,270	5,000	13,350					
1972 January	5,270	2,500	16,120		5,270		12,270	
February	5,540	2,500	19,160		5,540	$ 2,500	15,310	
March	5,540	5,000	19,700		5,540	5,000	15,850	
April	5,540	5,000	20,240		5,540	5,000	16,390	
May	5,760	5,000	21,000		5,760	5,000	17,150	
June	6,180	7,500	19,680		6,180	7,500	15,830	
July	6,180	10,000	15,860		6,180	10,000	12,010	
August	6,180	10,000	12,040		6,180	10,000	8,190	
September	6,480	10,000	8,520		6,480	10,000	4,670	
October	5,960	12,500	1,980		5,960	12,500		$ 1,870
November	5,960	12,500		$4,560	5,960	12,500		8,410
December	5,540	10,000		9,020	5,540	10,000		12,870
	$93,480	$100,250		$9,020	$77,130	$90,000		$12,870