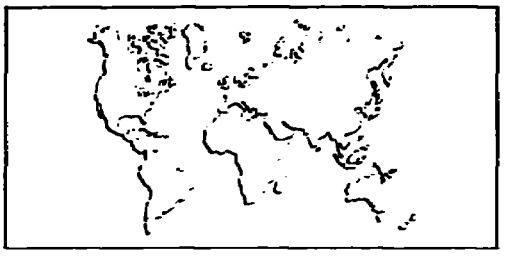
Environmental Assessment/Analysis Reports



Report E0031

Russian Federation - Second Oil Rehabilitation Project

EA Category A

Draft Environmental Impact Assessment

March 1994

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Public Disclosure Authorized

SECOND OIL REHABILITATION PROJECT

THE WORLD BANK

TYUMEN/TOMSK REGIONS PRODUCTION ASSOCIATIONS
YUGANSKNEFTEGAS
MEGIONNEFTEGAS
TOMSKNEFT

DRAFT ENVIRONMENTAL IMPACT ASSESSMENT

by the

TYUMEN TASK FORCE:
ABN AMRO BANK
LAZARD FRÈRES & CIE

with support by the
EUROPEAN COMMISSION

March1994

The power and enchantment of the taiga lies not in its large trees and absolute silence, but in the fact that only migratory birds know where it ends.

- Anton Pavlovich Chekhov

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Москва, 11 марта 1994 г.

Начальнику Отдела инфраструктуры,
энергетики и окружающей среды
III странового Департамента МБРР

г-ну Джонатану Брауну

Уважаемый г-н Браун,

Министерство топлива и энергетики Российской Федерации и Министерство охраны окружающей среды и природных ресурсов Российской Федерации рассмотрели Предложения по проектам предоставления МБРР Второго нефтяного займа.

Данная работа подготовлена Группой по реализации Тюменского проекта и Акционерными обществами (АО) "Томскнефть", "Юганскнефтегаз" и "Мегионнефтегаз" в тесном взаимодействии с российскими экспертами и специалистами, к разработке экологического обоснования была привлечена также независимая российская экологическая фирма "ФРЕКОМ ГмбХ", что позволило создать предпосылки для сотрудничества на следующем этапе исследований на стадии технико-экономического обоснования и проектирования.

В представленной работе отражена концепция, предполагающая стимулирование повышения нефтедобычи финансируемых АО "Юганскнефтегаз", "Мегионнефтегаз", "Томскнефть" и внедрение прогрессивных технологических решений, позволяющих минимизировать нагрузки на окружающую среду.

Для осуществления предприятиями мониторинга окружающей среды предусматривается организация материально-технической и методической базы, мероприятия и технические средства по предотвращению коррозии трубопроводов, применение современных технологий по восстановлению растительного покрова, почв и гидроресурсов.

В результате проведенных исследований в целом объективно оценен анализ воздействия хозяйственной деятельности АО "Томскнефть", "Юганскнефтегаз" и "Мегионнефтегаз" на окружающую среду, даны рекомендации по снижению техногенных нагрузок.

Отчет был представлен и в целом одобрен Администрацией и природоохранными органами Ханты-Мансийского округа, в процессе его разработки неоднократно обсуждался на рабочих совещаниях с представителями Минприроды РФ, Минтопэнерго РФ, ГР "Роснефть" и Нижневартовского комитета по охране природы.

При реализации проекта для указанных трех нефтяных акционерных обществ будут проводиться исследования и работы по дальнейшему анализу воздействия развития этих АО, в частности, изучение возможности максимально полной утилизации попутного нефтяного газа, ликвидации нефтяных амбаров.

Дальнейшие проработки будут осуществляться в партнерстве с российскими специализированными организациями и фирмами, имеющими соответствующий опыт работ, и в частности, по оценке воздействия на окружающую среду.

Одновременно сообщаем, что рассмотренные материалы по проекту будут, как это предусмотрено существующими требованиями, представлены для ознакомления заинтересованным сторонам, организациям и их представителям как в центре, так и на местах через соответствующие органы местной администрации.

С уважением

Министр топлива и энергетики
Российской Федерации

Ю.К.Шафраник

Министр охраны окружающей
среды и природных ресурсов
Российской Федерации

В.И.Данилов-Данильян

March 11, 1994

Mr. Jonathan Brown
Chief
Infrastructure, Energy & Environment
Country Department III
World Bank

Dear Mr. Brown,

The Ministry of Fuel and Energy of the Russian Federation and the Ministry of Environmental Protection and Natural Resources of the Russian Federation have reviewed the project proposals and Environmental Assessment related to extension of the IBRD Second Oil Loan.

This work has been prepared by the Tyumen PIU and Joint Stock Companies (JSC) "Tomskneft", "Yuganskneftegas" and "Megionneftegas" in close cooperation with Russian experts and specialists; the independent Russian environmental firm "FRECOM Gmbx" has also been attracted to help develop the environmental study which allowed to lay grounds for cooperation at the subsequent stages of feasibility study and design.

The submitted report reflects the concept which envisions incentives for accrued oil production by the financed companies "Yuganskneftegas", "Megionneftegas", "Tomskneft" and implementation of advanced technological designs making it possible to minimize environmental impacts.

Organization of the material, technological and methodological base, arrangements and technical means to avoid corrosion of pipelines, application of advanced technologies aimed at rehabilitating vegetation, soils and hydraulic resources would be stipulated to allow enterprises to carry out environmental monitoring.

As a result of the studies made, the environmental impact has been in general objectively assessed as regards the economic activities of Tomskneft, Yuganskneftegas and Megionneftegas; recommendations have been given to lessen technological loads.

The report has been submitted to and as a whole approved by the Administration and environmental authorities of the Khanty-Mansijsk okrug; in the process of its preparation, it has been repeatedly discussed at working meetings with representatives of the Ministry of Environment, the Ministry of Fuel and Energy of the Russian Federation, Rosneft, and the Nizhnevartovsk Committee for Environment Protection.

In implementing projects for the above three oil companies, further works and studies would be conducted to assess the environmental impacts of the development of these JSCs; to be specific, the maximum recovery of oil flaring gas and liquidation of oil storage pits would be considered.

Further processing would be carried out in cooperation with Russian specialized agencies and firms which possess an appropriate experience of work, particularly in environmental

impacts.

At the same time, please be informed that the project materials reviewed would be, as specified by existing requirements, submitted for familiarization to concerned parties, organizations and their representatives both in the Center and locally through respective local authorities.

Best regards,

Y.K.Shafranik
Minister of
Fuel and Energy
of the Russian Federation

V.I.Danilov-Danilian
Minister of
Environment Protection
and Natural Resources
of the Russian Federation

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Исх. № _

Г-ну Ч.МакФерсону
Руководителю направления
Мировой Банк

На встрече с господами В.Сирохи, С.Пибоди, Ф. де Вазье, состоявшейся в г.Ханты-Мансийске 10 марта 1994 года, рассмотрены проекты обеспечения экологической безопасности ведения добычи нефти на месторождениях акционерных обществ "Юганскнефтегаз", "Мегионнефтегаз", "Томскнефтегаз".

Комитет по охране окружающей среды и природным ресурсам Ханты-Мансийского автономного округа одобряет проекты программ инвестирования замены труб для транспортировки нефти, внедрения безамбарной технологии бурения скважин, повышения нефтеотдачи пластов, разработки и реализации мероприятий по ликвидации последствий загрязнения окружающей среды нефтью и нефтепродуктами, буровыми сточными водами, закупки техники и оборудования по рекультивации загрязненных нефтью земель и воды, создания системы экологического мониторинга, подготовки российских специалистов.

Предложенные проекты программ охраны окружающей среды полностью отвечают требованиям комитета, выдвинутым им в ходе рассмотрения вопросов лицензирования на право пользования недрами.

Вместе с тем для организации контроля за реализацией вышеуказанных проектов, создания системы экологического мониторинга комитет нуждается в современных приборах и лабораторном оборудовании.

Решение вопросов кредитования программ, оснащения окружного комитета лабораторным оборудованием позволит улучшить экологическую обстановку в округе, обеспечить постоянный контроль за выполнением программ.

Председатель комитета
по охране окружающей среды
и природных ресурсов
Ханты-Мансийского
автономного округа

В.А.Долингер

March 11, 1994

Mr. C. McPherson
Task Manager
Russia Second Oil Rehabilitation Project
World Bank

At the meeting with Messrs. V.Sirohi, S.Peabody, F.de Wazier which took place in the city of Khanty-Mansijsk on March 10, 1994, projects related to the environmental safety support in producing oil at the fields of Yuganskneftegas, Megionneftegas, Tomskneft have been discussed.

The Committee on Environment Protection and Natural Resources of the Khanty-Mansijsk autonomous okrug approves the draft investment programs for replacing oil transport pipes; introduction of oil pit-free technologies for well drilling, increase in oil reservoir recovery; development and implementation of actions aimed to eliminate consequences of environment pollution with oil and oil products, drilling water; procurement of equipment and machinery to ameliorate soils and waters polluted with oil; establishment of the environmental monitoring; and training of Russian specialists.

The proposed environment programs fully meet the requirements of the Committee made in the course of discussing the issues of licensing for the right to manage subsoils.

At the same time, to arrange supervision over the implementation of the above projects, establish environmental system monitoring, the Committee would require contemporary instruments and laboratory equipment.

The resolution of issues related to program lending, providing the okrug Committee with the lab equipment would improve the environmental situation in the okrug, and ensure a continued control over implementation of the programs.

V.A.Dolinger
Chairman of the Committee on
Environment Protection and Natural Resources

CHAPTER I
EXECUTIVE SUMMARY

This environmental assessment is one of the application requirements for the Second World Bank Rehabilitation Project and is submitted on behalf of three Russian Production Associations: Tomskneft, Yuganskneftegas and Megionneftegas. These associations, and the oil fields that are the subject of this project, are located in the Tyumen and Tomsk regions of Western Siberia. Eight producing oil fields are planned for rehabilitation and environmental protection measures as part of this project.

This environmental assessment was funded by the European Commission and prepared by the Tyumen Task Force (a joint enterprise of ABN AMRO Bank and Lazard Frères & C°) to meet the requirements of the Russian Federation and the World Bank and is contingent on approval by the Russian Ministry of Environmental Protection and Natural Resources and the Ministry of Fuel and Power. It is the product of extensive consultations with Russian Federal ministries and local governmental agencies, and with representatives of concerned local organizations and with beneficiary Production Associations.

Despite a very well developed body of environmental protection legislation in Russia, there has been, until recently, relatively little concern for the environmental impacts of oil development and poor enforcement of this legislation. This has been due to a lack of financial support and access to up-to-date equipment and services available internationally in the oil and gas industry, as well as an overriding emphasis in the past on meeting gross production goals to support industrial investment.

Historic oil and gas activities in Western Siberia have had a very serious impact on all aspects of the regional ecology (land, forests, rivers, wetlands, groundwater, soil, air). Moreover, pollution migrating from the region via waterways and atmospheric deposition pose serious problems for other regions.

Past and present oil and gas operations in the oil fields within the scope of this project have significantly affected air quality, soil quality, water quality, ecological resources, and national minorities in the immediate area of these operations. The development of the associated infrastructure (cities, towns, utilities, transportation) has displaced and significantly changed the life styles of national minorities and displaced fauna and flora.

Oil and gas production operations have released contaminants to the environment. Releases to the air include incomplete combustion contaminants due to poor flare design and burning of oil in pits and spill areas. Venting and fugitive emissions have released hydrocarbon gases to the atmosphere. Part of oil spilled simply evaporates, adding to the air pollution.

Releases to soils and waters have primarily been produced liquids (crude oil, condensate and brines), drilling and completion fluids and chemicals, as well as drilling mud wastes. The primary causes of these releases are pipe and equipment failures due to internal corrosion and lack of containment for disposed drilling mud wastes. Other causes include old equipment, poor operating procedures, poor construction and materials specifications, lack of maintenance, poor monitoring and detection, lack of adequate equipment to respond to releases, and lack of adequate training.

Produced water is brackish, and when spilled into the environment, eliminates most terrestrial and aquatic vegetation and causes fish kills. Fewer produced water spills will also decrease the loss of vegetation from wetlands and riparian areas as well as fish and other aquatic species from streams and rivers.

The proposed oil rehabilitation project will generally result in improvements to the environment through actions which will prevent future releases of contaminants to the environment. The proposed project is limited to existing oilfields and should not result in incremental negative impacts with the exception of some increase in flaring of associated gas due to greater oil production. The project also presents an ideal opportunity to begin the process of reversing past damage and to initiate better control of the myriad of environmental problems facing the Producer Associations. The project will provide significant equipment, materials, services and training to assist the Production Associations to plan and execute future remediation projects to improve environmental conditions.

The key environmental related elements of the program are:

- Oil field rehabilitation:
  - Replacement of failing pipelines and gathering facilities with corrosion resistant pipelines
  - Use of rigs with improved waste handling facilities and closed-loop drilling mud systems
  - Provision of "state of the art" well completion services
  - Transportable production units
  - Review of Operations Philosophy

- Acquisition of environmental control, testing and remediation equipment:
  - Cleanup and spill response equipment
  - Chemical laboratory
  - Corrosion laboratory
  - Field testing equipment
  - Environmental measurement instruments

- Planning and program development:
  - Environmental management systems and programs
  - Mitigation plans
  - Field redevelopment studies

- Environmental monitoring:
  - Baseline studies
  - GIS database development

- Pilot Clean-up programs:
  - Soil contamination assessment
  - Recultivation study
  - Experimental flare systems

- Appropriate training in the use of the above equipment and systems.

The program should have two major impacts on the operation of the oil fields: improvement of the equipment used in the oil fields, by making use of the latest technological innovations; and improvement of the Production Associations' capabilities to implement best available techniques for environmental protection.

Pollution prevention is a major objective of the project. The closed-loop mud system recycles mud liquids rather than discharges them; corrosion-resistant pipelines are far less likely to fail and cause spills into the environment; and improved well cementing operations prevent drilling fluids and produced fluids from entering ground water.

Modern rigs and equipment, with weather protection, blowout prevention and surer fittings, will protect the health and safety of workers over current conditions.

Fewer oil spills means a lower rate of fouling of wetlands, aquatic ecosystems, and soil. It will also decrease the potential for fires on spilled areas, which will reduce the addition of particulate matter, organic compounds, nitrogen oxides and sulfur oxides entering the atmosphere. Fewer areas will be lost for wildlife habitat and agriculture. Furthermore, more oil will be available for sale, enhancing revenues.

More complete combustion of the gas that is flared, will reduce the amount of hydrocarbons entering the atmosphere. This reduction in air pollution will reduce the ambient concentrations of ozone and benefit forests, animals and people.

National minorities will have opportunities to participate in the project. In addition to the local coordination the local organizations will have in the development of the project, the Production Associations will make all reasonable efforts to employ national minorities, purchase local products of minority enterprises, and participate in community programs that benefit national minorities. No new land will be taken from any person for this project, and as the environment improves, significant benefits will accrue to those who receive their food and shelter from the land.

Measures to further reduce environmental degradation will be included in the project. Existing well pads and access roads will be used for new wells wherever possible, using techniques of slant and horizontal drilling. Where new pads and access roads must be used, they will be constructed so as to minimize the impact on the environment. Sensitive areas such as wetlands and forests will be avoided. The roads and pads will be elevated to be above the flood stages of rivers, so that floods do not carry away potential contaminants. Culverts will be used in the roads to allow natural drainage across roadways.

Environmental conditions in the oil and gas production operations of Western Siberia will require many projects of this type. It will also take time to reverse the trend of environmental degradation and attain realistic objectives for repairing past and present practices. As it is, the initiatives of this project will only cover a relatively small part of the territory of Western Siberia. But it is important to see it as the start of a much larger effort at improvement. Initiating these improvements can have a dynamic impact on the solving of environmental problems elsewhere, and point the way for other programs in the region, thus multiplying the initial effects.

The results of this environmental assessment indicate that funding of environmental activities and equipment as part of the rehabilitation project will ultimately improve part of the environment of Western Siberia significantly. Correcting the current situation on the wider scale will require

substantial time and effort. To assist the natural process of environmental restoration, it will be necessary to ensure that further environmental impacts are minimized, if not completely prevented.

Finally, respect of the rights of the national minorities will be taken into account to ensure that they retain their identity and traditional activities, as well as play a role in the development of the region.

Respectfully submitted,

The Environmental Assessors

CHAPTER II
POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

A. Purpose and Scope of Environmental Assessment

The purpose of this environment impact assessment is to identify the positive and negative potential environmental impacts of the proposed second Oil Rehabilitation Project submitted by the Production Associations Megionneftegas, Tomskneft and Yuganskneftegas, and their representative the Tyumen Task Force, to the European Commission and the World Bank for financing consideration. This environmental assessment has been prepared as part of the World Bank and Russian requirements for such projects. It describes the proposed action, presents its environmental impacts and compares three alternative actions. The project is in preliminary planning stages at this writing. More specific environmental impacts will be presented in later assessment documents as design phases are completed.

B. Environmental Legislation by the Russian Federation

The political and legislative basis of new Russian environmental legislation is the Constitution of the Russian Federation and Constitutions of Republics that are part of Russian Federation. Development of environmental legislation in Russia is done in three ways:

- Developing modern environmental legislation, taking into account the required payments for natural resources on the basis of existing complex regulations;
- Integration of environmental considerations in the existing natural resources and environmental protection legislation; and
- Integration of environmental considerations in economical, financial, administrative, state, civil, criminal and other branches of legislation.

New environmental legislation is created dynamically, to fill gaps in legislation currently in force, and to add regulations to address changing conditions of development of society. Also, legislative modifications are necessary to address standards stated in different legislative acts which often duplicate or contradict one another.

Proprietorship, use and disposal of land, water, mineral and other natural resources, are regulated by the basic legislation, codes, laws of the Russian Federation, legislation of Republics,

legal acts of autonomous provinces (Oblasts) and autonomous districts (Okrugs) that are part of the Russian Federation.

On federal level the main legislative acts in this field are:

- Law on Environmental Protection (1991):
- Main Principles of Forest Legislation (1993);
- Land Code (1991);
- Water Code (1972);
- Law on Mineral Resources (1993); and
- Laws on Atmospheric Air Protection, Protection and Use of Animal Resources (1982).

Besides these legislative acts, regulation of environmental protection is affected by the Laws on Kray (republic) and Oblast (province) Soviets of People's Deputies, and Kray, Oblast Administration (1992), on local self regulation (1992), on sanitary-epidemiologic prosperity of population (1990), on enterprises and business activities (1990), on foreign investments (1990), on excise (1991), and on public prosecution (1992). These acts regulate economic activities including control and responsibility for fulfillment of environmental demands.

Important legal regulations on natural resources consumption and environmental protection are included in non-legislative acts: Decrees and Orders of the President, Acts of the Russian Federation Government and Administrative Acts of Federal Ministries and Institutions. Also, non-legislative acts of Ministries and Institutions of the Russian Federation determine standards and rules of environmental protection regulating state bodies, enterprises, associations, organizations, institutions and citizens in the interests of natural resources and environmental protection. However, these acts are generally directed to the protection of human beings and do not always protect other organisms, populations, or ecosystems.

About fifteen new legislative and non-legislative acts of environmental regulation are being developed at the federal level. These laws will protect certain natural areas, institute land use legislation, regulate the use of flora and fauna, and integrate the criminal code and environmental protection laws.

In spite of the progress in creation of environmental legislation, the efficiency of legal regulation of environmental protection and use of natural resources is rather slow. There is a large gap between the ecological regulations and practical use of ecological legislative acts, especially in

the sphere of economical activities of industry, including oil and gas industry, construction, energy and agriculture.

The necessity of ensuring practical implementation of environmental legislative demands requires improvement of the legal system, improvement of management, administrative and policy-making activities and increasing enforcement for environmental legislation violations.

C. Environmental Regulations for Oil Production

A regulation for the design and evaluation of industrial activities must also address environmental impacts (OVOS). This act is described in the Handbook on Project Definition under the "Environmental Protection" section for SNiP 1.02.01-85, which is still in force in the Russian Federation. In addition to this Handbook, OVOS for the oil industry must be determined by methods recommended by Minnefteprom of the Russian Federation in 1991-1992. According to these documents, OVOS (environmental impact assessment) must be conducted not only for the developing areas but for the ecology of the adjoining regions as well (cross-boundary problems). Means to mitigate or prevent negative consequences in the short-term and long-term perspectives must be determined. The oil and gas industry OVOS also includes additional investigations concerning the social consequences, complex environmental impacts, analysis of environmental cleanup and spill response measures, estimation of risks and order of magnitude and ecological and economical evaluation of enterprise activities. In general, OVOS corresponds to international standards.

Regulations of Minpriroda (Ministry of Environmental Protection) of the Russian Federation state that the OVOS is to be included in all projects of oil field facilities construction as a part of the environmental protection section. Moreover, registration of new enterprises or joint-stock companies must submit data on the technical characteristics of the project and the environmental impacts (a "mini-OVOS") for State environmental review. During the evaluation of oil and gas facility environmental impacts, the maximum permissible criteria of different pollutants' influence on the environment must be taken into account. If approved, environmental certificates are issued which describe the current environmental situation and identify the necessary environmental actions for all projects according to the common federal standard.

The lists of maximum permissible concentrations and reference safe impact level of hazardous substances for air quality, water of fish industry reservoirs, and land resources, as well as the sanitary standards of permissible impact of hazardous substances on human beings, are determined and issued by the corresponding control bodies of Rosrybvoda (fisheries) and Roscomsanepidnadzor

(health protection) of the Russian Federation. These standards generally do not correspond in value with standards of maximum permissible concentrations adopted in Europe and the United States.

The calculations of maximum permissible emissions and discharges are produced by the environmental protection staff specialists, or on their order by sectoral or environmental protection research and design institutes. The maximum permissible emissions and discharges of hazardous substances must be coordinated with the local environmental protection authorities. Both the calculation of maximum permissible emissions and discharges and coordination of their levels with environmental protection authorities are considered in environmental protection activities plans of the production associations.

D. Environmental Protection Authorities in the Russian Federation

Functions of specially authorized agencies of the Russian Federation in the area of environmental protection on the federal level, in the constituent republics, autonomous Okrugs and territorial units (Krays and Oblasts) are determined in the "Law on Environmental Protection," adopted 19 December, 1991.

The central link in the environmental protection structure in Russia and the main analytical and coordinating organ in the region is the territorial (republics within the Federal government. Kray, Oblast, or Okrug) Committee of the Ministry of Environmental Protection which normally has the following main divisions (departments):

- Economic regulation of environmental protection;
- State environmental review;
- Analytical laboratories and logistics support;
- State environmental control and monitoring; and
- Mapping of natural resources areas.

Independent municipal and regional committees for environmental protection have been organized in the cities of Oblast and Kray level. Their functions are coordinated between local authorities and territorial environmental protection committees. In some regions there are also inter-Regional inspections and committees which coordinate environmental protection and monitoring activity in several regions.

1. Legislative Bodies and Subordinated Environmental Protection Structures

State policy on environmental protection and executive agencies to implement them was the exclusive responsibility of the Supreme Soviet of the Russian Federation, disbanded by the President's Decree in September 1993. A special committee of environmental protection and rational use of natural resources acted as one of the Supreme Soviet bodies. Now it is supposed that these functions would be passed to Federal Assembly. Election of its members in the Khanty-Mansiysk Okrug will be conducted in April 1994.

The State Office of the Public Prosecutor acted in direct subordination to the Supreme Soviet for the observance of environmental legislation supervision, Department and State Committee on sanitary-hygienic supervision, worker hygiene, water quality and food products control, and determination of hygienic regulations of environmental quality.

2. Central Executive Power

The Russian Federation Government conducts the state environmental policy, drafts and implements state environmental programs and plans, coordinates the activities of ministries, and agencies in the Russian Federation for environmental protection. Also, the authority of the Government includes the establishment of procedures for development and approval of environmental standards for emissions and discharges of pollutants into the environment as well as procedures for setting fees and maximum fee amounts for use of natural resources, environmental pollution, waste storage and other types of harmful activity. As a part of Council of Ministers of Russia is the Department of Natural Resources Use, Environment and Public Health Protection. The head of the Department is Vitaly Parfenov.

3. Ministry of Environment and Natural Resources

The Russian Federation Ministry of the Protection of Environment and Natural Resources (MPENR) is a duly authorized State organ in the area of environmental protection. Its Minister is Victor Danilov-Danilyan. The Ministry's functions include:

- Comprehensive management in the area of environmental protection in Russia;
- State control and monitoring of the use and preservation of land, subsoil resources, surface and ground waters, the atmosphere, forests and other natural resources, and monitoring the compliance with ecological safety standards;

- General organization and coordination of environmental monitoring and control;
- Approval of standards and regulations, participation in the development of standards regulating natural resources use and protection of the environment;
- Conducting state environmental reviews;
- Issuing licenses for the burial (or storage) of industrial and household wastes, emissions and discharges of pollutants into the environment;
- Restriction or suspension of activities by enterprises that operate in violation of environmental protection legislation or licenses for the use of natural resources or in excess of limits on pollutant emissions and discharges; and
- Lawsuits demanding compensation for damages incurred as a result of violations of environmental protection legislation.

The Ministry has established a Federal environmental fund which accumulates in part from collection of environmental fees, penalties and other payments. The fund finances environmental projects of Federal importance.

4. Territorial Committees

Territorial (Kray and Oblast) Committees for the protection of environment and natural resources have been established. They have the authority for the following:

- Recording and assessment of natural resources, record keeping of environmentally harmful sites and enterprises;
- Recording and assessment of the volume of wastes produced during production and consumption by enterprises within their regions;
- Coordination of environmental protection activity by local authorities, enterprises, institutions and organizations;
- State environmental monitoring and decision making in regard to restriction, suspension or termination of operations of facilities which do not meet the environmental protection legislation;
- Conducting the environmental review of the projects implemented in their territory;
- Bans on construction of environmentally harmful facilities; and
- issuing of permits granting the right to use the environment and its resources, to emit or discharge harmful substances, or to store wastes.

5. Local Self-Government Authorities

Local self-government authorities on the region level conduct the following activities in environmental protection:

- Recording and assessment of the current state of the environment in the areas under their protection;
- Arrangement of environmental review and state environmental control;
- Recording and assessment of the volume of production wastes at facilities located in their territories;
- Issuing of licenses for certain types of natural resources use, for emissions and discharges of harmful substances and for the burial of toxic wastes; and
- Decision making in regard to restriction, suspension or termination of environmentally harmful activities.

6. Other Institutions of the Federal Government

By the general coordination carried out by the Russian Federation Ministry of the Protection of Environment and Natural Resources, the following institutions of the Federal Government perform special functions of State regulation in nature protection:

- The Federal Service of Russia on Hydrometeorology and Environmental monitoring is responsible for the State system of environmental monitoring according to chemical, radiometric and hydrobiological indicators;
- The Ministry of Agriculture is responsible for the control of pesticides and chemical herbicides, taking stock of soil pollution with these substances;
- The State Committee of Emergency Situations is responsible for exposure of emergency situations connected with pollution or other large-scale negative environmental impact, carries out the measures of localization and elimination of such situations;
- The Russian Federation Committee of Geology and Use of Mineral Resources is responsible for mineral resources protection;
- The Russian Federation Committee of Fish Industry is responsible for fish resources protection;
- The Russian Federation Committee of Land Resources and Land Tenure is responsible for land resources protection;

- The Russian Federation Service for Forest Industry carries out the protection of forest resources: and
- The Russian Federation Committee of Water Industry is responsible for taking stock of water use and rational management of water resources.

Environmental protection bodies often become subordinate to local authorities.

7. Environmental Departments in Industry

Environmental departments are often found in industrial enterprises whose activities are connected with the use and consumption of natural resources and affect the environment. Their main functions include:

- Verification of compliance of the enterprise activity with plans and measures for environmental protection and rational use of natural resources;
- Ensuring the compliance with environmental quality standards, compliance with the requirements of environmental protection and orders and instructions of environmental protection authorities;
- Environmental monitoring and observation of the emissions, discharges and wastes produced at the enterprises; and
- Collecting, analyzing and updating of data and information of the enterprise activity in the area of natural resources consumption and environmental pollution.

Ministries of industrial sectors, such as the Ministry of Fuel and Power, also generally have central environmental protection departments or divisions which coordinate the activity in this area and conduct preliminary environmental assessment and review of the projects and feasibility studies.

E. State Environmental Review

State Environmental Review (*Gosudarstvennaya ecologicheskaya expertiza*) in Russia must be conducted before any economic decision is made that may have an adverse impact on the environment. Financing and performance of work related to all projects on the territory of the Russian Federation is permitted only after obtaining a positive statement from the environmental review authorities of the Russian MPENR.

The State Environmental Review consists of the following stages:

- Preliminary coordination of future activity;
- Review of project site evaluation, documentation, and coordination of conditions for the use of natural resources; and
- Comprehensive review of feasibility studies and issuing the permit for the use of natural resources.

The environmental review is usually conducted by a specially organized interdisciplinary team of specialists from scientific and academic institutes, universities, officials from governmental ministries and agencies and representatives of the public. One can appeal to the court or court of arbitration against the conclusions of the expert commission.

On the Federal level the Main State Environmental Review Board (Department) of the MPENR examines the documentation and conducts the review of feasibility studies and projects for construction, reconstruction of enterprises and facilities of federal importance (*e.g.*, main oil and gas pipelines, railways, power and nuclear fuel cycle installations, defence industry facilities, etc.); and feasibility studies and projects of the enterprises with foreign investment and other projects for which implementation can affect the environment of two or more republics within the Russian Federation, Krays, Oblasts, autonomous regions and bordering states.

The State environmental review of projects at the Republican, Kray, Oblast or local level is conducted by the review units of the appropriate Committee for environmental protection. Projects of local significance are those which are financed from local budgets or have limited influence on the environment of the specific territory.

F. Monitoring

Monitoring of the state of the environment in Russia for pollution levels is performed both by institutions of State environmental control and sometimes on the local level by special departments of the enterprises. The activity of all State institutions is coordinated by the Minpriroda of Russia, which is responsible for the common principles of the system of environmental monitoring, functioning, collection and generalization of information (on all levels, including each oblast) from all areas of activity, and providing the information to the administrative institutions, enterprises and public. Enterprises can operate under individual agreements with state institutions regarding baseline information collected in the area of influence of their operations.

The Departments of Minpriroda of Russia provide to the public data on the emissions and discharges by the enterprises, and observations of nature reserves. They also monitor and coordinate the reports of nature protection activities of the enterprises which are granted to the statistical institutions.

The observations of chemical content and radioactive pollution of water (seas, rivers, lakes, reservoirs, bogs), atmospheric air (in towns), soil, snow cover, and precipitation have been conducted for 30 years by the Federal Service of Hydrometeorology and Environmental Monitoring. The Service has about 120 laboratories, 25 regional technical and informational centers, and five specialized federal centers of collection and processing of information. The Service carries out the observations in nearly 250 towns and on more than 1,000 water bodies. Regional and federal laboratories periodically transmit the generalized information to the corresponding departments of Minpriroda of Russia, and to interested institutions. Information concerning extreme pollution (the standards are coordinated by all environmental protecting institutions of Russia) is immediately transmitted to all interested institutions, enterprises, and authorities of the towns and population.

Because of the lack of budget financing, the volume of observations decreased during the last two years by 15%. Previously, about 15% of town atmosphere quality testing was carried out by the departments of Minzdrav (Ministry of Health Protection) of Russia, and about 3% by the special departments of the enterprises. They used commonly accepted methods of observations and analysis.

During the last three years the institutions of sanitary-epidemiology supervision sharply reduced their observations in the atmosphere of environmentally protected areas and increased observations on the working places and industrial grounds. The enterprises, using loopholes in legislation, try to shift the responsibility of taking observations in the atmosphere and water to the federal monitoring service, retaining only the periodical observations of emissions and discharges and some sampling.

The observations of soil quality by the federal Service of Hydrometeorology include pollution by metals, fluorine, phosphorus in towns, and pesticides in agricultural areas. They are being conducted by the laboratories of State agrochemical service which control not only pollution but the biological productivity of soils.

The geological institutions conduct the monitoring of the quantity and chemical content of underground water. Institutions of the fish industry conduct monitoring of fisheries and sometimes

water quality. Institutions of the forest industry control the state of the forests. Institutions of hunting industry record the animal reserves. All this information in generalized form is transmitted to the institutions of Minpriroda and since 1987 is available for the public.

The creation of an industrial environmental quality monitoring system beyond the control of emissions and discharges is not obligatory for consumers of natural resources according to the law. However, it is being provided now primarily due to the constant pressure of environmental protection institutions and the administrations towards companies with poor environmental reputations.

G. Administrative Penalties for Noncompliance

On January 1, 1993, the Government of the Russian Federation ordered fees for permitted environmental pollution, waste disposal, and other kinds of hazardous impacts. In accordance with this Order two kinds of basic fee standards have been established:

- Emissions and discharges of pollutants, waste disposal, and other kinds of hazardous impacts within the limits of permissible standards; and
- Emissions and discharges of pollutants, waste disposal, and other kinds of hazardous impacts within the temporarily coordinated standards.

Basic fee standards are established for each pollutant according to the degree of hazard to the environment and public health.

For some regions and river basins, special coefficients for the basic fee standards are established. These factors take into account the ecological factors, natural and climatic features of the territory, and the significance of natural and social-cultural resources. The coefficients in Tomsk Oblast range from 1.02 to 1.04, and in Tyumen Oblast from 1.02 to 1.05.

Enterprises have a powerful incentive to maintain pollutant discharges within the standards. The fees for maximum permissible emissions, equivalent to a discharge permit fee, for discharge of pollutants and waste disposal are charged at the expense of prime cost of production. Payments for exceeding permissible levels are charged at the expense of profits to the enterprise. The maximum fine for environmental pollution in excess of the maximum permissible standards is set as a percentage of the profits remaining at the associations.

Recently, the environmental authorities have used another method of payment for environmental pollution. Where the local environmental authorities established the payment for normal emission and discharge, the coefficient increases by a factor of five for penalties.

The oil producing associations pay fees for waste storage in mud settling pits in accordance with the class of hazard for burying substances maximum permissible emissions and discharges. Penalties for accidental discharges and emissions are also charged. Table 1 shows the fees and penalties paid by three Production Associations in 1992.

Table 1
Costs of Fees and Penalties to the Production Associations in 1992
(Rubles)

	Production Association		
Category	*Yuganskneftegas*	*Megionneftegas*	*Tomskneft*
Administrative fee for discharging pollutants	27,438,000	2,430,000	5,309,000
Penalty for exceeding pollution limits	3,571,000	7,837,000	6,036,000

Negotiation does take place between environmental controlling bodies and industrial enterprises over the legal basis of penalties, and in some cases the enterprises can pay reduced amounts for environmental pollution, especially if they take prompt action to localize and mitigate pollution impacts. However, payments for environmental pollution do not release the associations from implementing environmental protection and rational use of natural resources. Associations are still liable for damage caused to the environment, health and property of citizens, and economic resources by environmental pollution in accordance with current law.

CHAPTER III
DESCRIPTION OF THE PROPOSED PROJECT

The World Bank is considering a second Oil Rehabilitation Project loan to support oil and gas production in the Western Siberian region of the Russian Federation. The loan would fund rehabilitation of oil production activities by Yuganskneftegas, Megionneftegas and Tomskneft, three newly privatized Production Associations of the central part of West Siberia. This project would remedy numerous inefficiencies and potential pollution sources from the aging physical facilities as well as institute cleanup, training and spill response activities.

A. Project Objectives

The proposed project would be performed in the Production Associations of Yuganskneftegas and Megionneftegas which operate oil and gas production in the Tyumen Oblast (province) of Western Siberia, and of Tomskneft which operates in both the Tyumen and Tomsk Oblasts. The project will rehabilitate selected areas of the Production Associations but not solve all production operations problems or environmental issues. To do so would be a monumental effort requiring many more resources and time than is available.

This project is one step of many prior and future efforts towards improving the Russian oil and gas operations, such that recovery and use of these mineral resources is optimized in an efficient manner while minimizing adverse environmental impacts to the region. The environmental methods and improvements developed in these three Production Associations should extend into the other oil and gas operations of the Russian Federation and lead to sustainable development in this very important area of Russian industry.

The project's objectives are to:

- Increase the medium- and long-term production potential;
- Improve environmental quality;
- Allow more effective use of equipment;
- Introduce new technologies and operating procedures;
- Benefit from third-party contractors' technologies;
- Introduce reservoir management procedures;
- Provide training in new techniques and procedures; and
- Introduce proper data collection and data administration.

B. Elements of the Proposed Action

Table 2 lists the main elements of the proposed action for each Production Association and in some cases for each field.

Table 2
Proposed Actions for World Bank Funding

	Production Association		
Type of Action	*Yuganskneftegas*	*Megionneftegas*	*Tomskneft*
Replace pipelines	Quantity unknown; $2 million reserved for rehabilitation	Megion: Oil 82 km Water 50 km	Sovetskoye: Oil 188 km Water 226 km Pervomaiskoye: All types 209 km Vakhskoye: Trunk loop 99 km High water cut 171 km
Provide workover rigs	Mamontovo: 8 Srednye Asomkinskoye: 2	Megion: 1	All fields: 3
Rework wells	Mamontovo: 476 Srednye Asomkinskoye: 100	Megion: 45 Pokamasovskoye: 80	All fields: 525
Provide mobile well gauging units	Mamontovo: 2	Megion: 2	All fields: 3
Provide drill rigs	Mamontovo: 1 Prirazlomnoye: 1	Megion: 1 Pokamasovskoye: 2	No
Drill new wells	Mamontovo: 24 Prirazlomnoye: 16	Megion: 26 Pokamasovskoye: 32	Sovetskoye: 2 Pervomaiskoye: 2 Vakhskoye: 3
Provide temporary transportable production units	None	None	All fields: 5

Table 2
Proposed Actions for World Bank Funding

Type of Action	**Production Association**		
	Yuganskneftegas	*Megionneftegas*	*Tomskneft*
Provide closed-loop drilling mud systems	Mamontovo: 1	None	All fields: 5
Provide facilities to collect associated natural gas	Prirazlomnoye: incremental development will collect associated gas	Pokamasovskoye: incremental development will collect associated gas	Sovetskoye Vakhskoye Pervomaiskoye Study
Perform field redevelopment study	Prirazlomnoye	Pokamasovskoye	Sovetskoye
Develop environmental management plan	Yes	Yes	Yes
Provide environmental cleanup and spill response equipment	Land & Water	Land & Water	Land & Water
Develop mobile analytical and sampling laboratory	No	Yes	Yes
Develop stationary analytical laboratory	Yes	Yes	Yes
Develop mobile corrosion laboratory	Yes	Yes	Yes

Table 2
Proposed Actions for World Bank Funding

Type of Action	**Production Association**		
	Yuganskneftegas	***Megionneftegas***	***Tomskneft***
Perform baseline study and GIS	Yes	Yes	Yes
Perform experimental environmental assessments of air, water, soil	Yes	Yes	Yes
Provide all-terrain piston coring unit	Yes	Yes	Yes
Perform experimental soil remediation and revegetation	Yes	Yes	Yes
Install experimental flare	Yes	No	Yes
Train staff to use equipment and perform spill response	Yes	Yes	Yes
Provide technology transfer with international experts	Yes	Yes	Yes

The proposed project was developed in response to several major environmental concerns, and, to the extent allowed by the budget and schedule constraints, remedy them. The project will reduce impacts to the environment through rehabilitation and redevelopment of existing oil and gas production operations by providing equipment, services and training. Also, the project will provide specific environmental equipment, laboratory analysis and field equipment, services and training in three key areas: environmental management and training, environmental cleanup and spill response, and experimental projects. The experimental projects included in the project will help direct the Associations in future actions on contamination assessment, bioremediation, revegetation, corrosion, and flare design.

The environmental management and training plan, and the environmental cleanup and spill response equipment and training, will provide specific resources to reduce releases through improved management and training and reduce impacts by providing equipment and training to respond to releases that do occur. The experimental projects are designed to provide equipment, services and training and to perform specific evaluations in several areas of assessment and mitigation to evaluate various alternatives and make recommendations for future mitigation actions.

The following discusses various parts of the oil field rehabilitation portion of the proposed project.

1. Pipe Replacement

Pipelines will be replaced in several field areas to mitigate releases caused by high rates of internal corrosion. The primary focus will be to replace water injection lines and high water cut oil lines. The project includes pipeline replacement with corrosion-resistant pipes in lines that have been subjected to high internal corrosion.

2. Workovers

The workovers will use modern rigs fully equipped for health and safety protection to bring many inactive wells into production, increase production in marginal wells, repair

behind pipe communications, and replace leaking wellhead equipment. Mud engineering will focus on methods to minimize the quantity and toxicity of mud wastes. Corrosion resistant materials will be specified for downhole and surface replacement equipment.

Many of the wells are idle due to poor mechanical integrity, lost equipment downhole, and poor primary cementation of the production casing. Workover candidates will be prioritized to optimize success rate and production. Mobile metering units have been included in the project to be used for screening wells for workover potential.

Rehabilitations and replacements included in the project include:

- New, winterized workover rigs with blowout preventers;
- Closed loop mud systems;
- Biodegradable muds;
- Clean out and circulation establishment;
- "Fishing" operations (retrieval of downhole equipment);
- Cementing operations;
- Electric submersible pump completions;
- Downhole tubulars;
- Reservoir stimulation, including hydraulic fracturing;
- Recompletions to alternative reservoirs;
- Rod pump replacement; and
- Christmas tree and valve replacement.

The workovers include four high-deviation side tracks in Pervomaiskoye Field. In northwest Megion field, which must stop production in low-lying areas during flooding (usually May through July), workovers will increase the elevation of wellheads, well pads, and portions of the access roads, and inserting culverts across the access roads to facilitate drainage.

3. In-fill Drilling

In-fill drilling will be performed, where possible, from existing underused or inactive well pads to avoid construction of more roads and pads. Additional access roads, if necessary, will include culverts across the roadway to facilitate drainage of flood and storm waters. New, modern rigs will be used to increase production and minimize the number of new wells by using horizontal drilling techniques. Also, high-angle drilling will be used to capture production from areas which are located in environmentally sensitive areas like flood plains, rivers and forest reserves. Drill rigs will be fully equipped for health and safety protection. Mud engineering will minimize mud wastes and toxicity. Downhole and surface well equipment will be specified to be constructed of corrosion-resistant materials.

In-fill drilling will include the following:

- High angle and horizontal drilling;
- New winterized drill rigs with blowout preventers;
- Closed loop mud systems;
- Biodegradable muds;
- Downhole tubulars;
- Wellhead equipment;
- Flow lines;
- Electric submersible pump completions;
- "Measurement while drilling" logging services;
- Perforating services;
- Conventional logging services; and
- Wireline logging services.

Temporary transportable production units will be used until permanent production facilities have been connected.

4. Associated Gas Utilization

In conjunction with imposed flaring techniques proposed in the project, studies will be undertaken to determine the optimum way to minimize unnecessary waste and improve utilization rate of associated gas produced in Tomskneft fields (Sovetskoye, Vakhskoye and Pervomaiskoye). An immediate goal will be reduced fines paid by Tomskneft due to pollution from venting and flaring of associated gas or poor combustion at existing flares.

5. Field Redevelopment Studies

Field redevelopment studies will be performed on one field of each Production Association to evaluate the potential for redevelopment to optimize economic and environmental performance. Several exploitation options will be considered with the goal of maximizing ultimate oil recovery profitability while minimizing the number of new wells, access roads, new well pads and environmental impacts. The studies will also provide valuable training to Production Association personnel.

The field redevelopment studies will consider:

- Drilling techniques (directional drill, horizontal drill);
- Flowlines (corrosion protection);
- Detection and spill response;
- Minimisation of pads and roads;
- Associated gas use; and
- Environmental protection: environmental management plan, baseline study, monitoring plan, mitigation plan, restoration plan.

C. Environmental Protection

Oil and gas production introduces a number of hazardous substances into the environment. Emissions to the atmosphere include hydrocarbons, nitrogen oxides, carbon monoxide, sulphurous

anhydride, particulate matter, and hydrogen sulphide. Pollutants that are added to water include oil and oil products, formation saline waters, synthetic detergents, corrosion inhibitors, demulsifying compounds, chemical reagents, drilling mud liquids and solids.

Since the 1960s, oil and gas operations in Western Siberia focused on increased production, which provided the capital needed for the industrial development of the country and in generating foreign currencies. There was minimal environmental investment, resulting in a major degradation of the region and its natural resources. Although environmental legislation has long been very comprehensive in this country, its implementation has been light due to the above considerations, the difficult working conditions in this Sub-Arctic region, the lack of appropriate technologies and equipment, and the weakness of enforcement.

Most of the existing pollution problems in western Siberia occurred before *perestroika*, when production of oil was more important than solving environmental problems. However, after the Environmental Protection Law of the Russian Federation was enacted, the state of the environment of the Production Associations aroused concerns. Nonetheless, environmental protection activities have been significantly hampered in this area due to the severe climate of Western Siberia, long distances, difficult access in marshland, lack of environmental knowledge among workers and the local population, and a shortage of financial resources for environmental monitoring and purchasing necessary equipment.

Only recently has this trend begun to reverse. A project like this one is an ideal opportunity to bring in, at a pilot scale, the methods, technologies and equipment to give significant environmental improvement.

The Production Associations have a high level of environmental awareness. The environmental departments have been interested in accomplishing much of the proposed project for a long time, and are pleased to be given the opportunity to equip themselves with the proper devices to improve environmental management.

A significant proportion of the loan will be directed to environmental equipment and training and the recommendations cover the following.

- Development of Environmental Management and Training Plan for each Production Association:
  - Management and Training Plan will be developed according to commonly accepted Russian and international standards for environmental management; and
  - Training will be provided at the Production Association and NGDU level.
- Environmental protection equipment and training for each Production Association:
  - Environmental cleanup and spill response equipment will be provided to respond to crude oil releases on land and on water bodies, to clean up mud pits and soils; and
  - Training will be provided in the use of the equipment and manuals will be developed.
- Laboratory analysis and field equipment and training for each Production Association:
  - Laboratory analysis equipment will be provided to perform environmental analyses;
  - Provide mobile truck-mounted laboratory analysis units;
  - Field sampling and monitoring equipment are included; and
  - Operations manuals and training will be provided in the use of the equipment.
- Spill prevention program for pipeline corrosion problems:
  - Provide mobile laboratory for corrosion assessment;
  - Internal corrosion sampling and analysis including material samples, produced water samples and produced gas samples;
  - Select best corrosion inhibitors, corrosion-resistant materials and liners; and
  - Define optimized field design to minimize lines exposed to corrosion from formation waters.
- Pilot programs and training at each Production Association:
  - Evaluation of the best techniques for remediation under local conditions, including small-scale experiments;
  - Evaluation of best revegetation techniques for local conditions;
  - Flare assessment, covering the types of flares used (Tomskneft and Yuganskneftegas only), gas composition, pressure flowrate, temperature, an requirements for emissions and smokelessness;
  - Experimental replacement flare (Tomskneft and Yuganskneftegas only); and

- Study of the possibility of using low-pressure associated gas to power a thermal soil remediation unit.

- Monitoring programs at each Production Association:
  - Baseline study of all eight fields on all three Production Associations;
  - establishment of geographical information system database; and
  - Assessments of air, soils, surface waters and bottom sediments, and shallow ground waters.

1. Environmental Cleanup and Spill Response

The environmental cleanup and response portion of the proposed project is to provide one basic set of equipment, such as a trailer-mounted mobile mud liquids separation unit for mud pit cleanup, vacuum trucks for soil cleanup, skimmers, booms and boats for water cleanup, and a mobile aeration and bioagent spraying unit for bioremediation. Manuals and associated training will be provided for responses to releases of crude oil on land, marshes and waterways. Each Production Association will receive the appropriate equipment for its needs. An environmental audit by international consultants which specialize in that area of expertise will be the basis for the detailed equipment specification and development of the manual and training program. It is anticipated that each Production Association will expand their environmental protection capabilities in the future to meet the specific needs in all areas of their operations. Thus a foundation will be placed on which future programs can be built.

2. Laboratory Analysis and Field Sampling and Monitoring Equipment

The proposed project will supply laboratory analysis equipment and field testing and monitoring equipment to add these capabilities to the Production Associations. With these tools and the training to use them, the Production Associations will be able to perform analyses of the state of the environment and impacts of operations. It is assumed that the Production Associations will provide adequate building areas and facilities (including furnishings) for

equipment to obtain accurate and reproducible results. Also, the Production Associations would be responsible for providing storage areas.

The equipment would be delivered, set up, made operational, and calibrated. Training will be provided in the use of the equipment. A major portion of the field sampling equipment includes an all-terrain truck mounted piston coring unit which is fully equipped for sampling soil, water, soil vapor and gas, and installing monitoring probes.

These equipment items are planned for use during the pilot programs of the proposed rehabilitation project. Some additional analyses will be performed by outside laboratories for quality control purposes and for analysis beyond the capability of the laboratory equipment available. Proposed equipment for this project may need to adjusted during project implementation based on changing conditions within the Production Association and the results of the inital programs.

3. Spill Prevention Program

The primary focus of this program is to study means to reduce or avoid corrosion in pipes that leads to failures and spills. The purpose of the program is to evaluate the causes for internal corrosion. External corrosion is of minor concern compared to internal corrosion; therefore, little effort should be focused on external corrosion.

Mitigation and control of corrosion is probably the most important aspect of the rehabilitation project from an environmental standpoint due to the number, size and duration of releases related to corrosion-associated equipment failures. It is anticipated that the corrosion assessment would consist of the following phases:

- Preliminary Site Assessment, Data Analysis and Prioritization;
- Field Sampling;
- Laboratory Analysis;
- Engineering Analysis and Reporting; and

- Training and Operations Manual.

The preliminary site assessment, data gathering, analysis and prioritization objective is to obtain and review available data, discuss corrosion concerns with the appropriate Production Association and NGDU personnel and management, and observe and perform field monitoring and analysis in selected areas which have corrosion concerns. The preliminary assessment should include the following areas for evaluation;

- Primary areas, equipment and materials which have been affected by corrosion;
- Operational procedures related to the primary areas of corrosion;
- Material handling and storage;
- Welding and connections procedures/methods and materials;
- Cathodic protection;
- Inhibitor types and quantities, liners, and other methods previously used to address corrosion;
- Available information and reports for past corrosion assessments;
- Materials highly susceptible to corrosion observed in new condition for evidence of quality concerns (roundness, smoothness, pitting, flaws, etc.); and
- Specifications for materials types and construction.

The preliminary assessment results should be used to generally categorize and identify the areas of corrosion, develop hypotheses on the mechanisms of corrosion, and prioritise the areas and media to be sampled for laboratory analysis. Some additional field analysis may be necessary.

The field sampling and analysis should target those areas of highest priority to obtain samples for laboratory analysis. Based on the findings to date, the primary areas of concern are flowlines and gathering lines which transport produced fluids containing large percentages of produced waters and involve internal corrosion within the pipes and at welds. It is anticipated that several of the following will be evaluated by laboratory analysis:

- Produced water chemistry;
- Produced gas chemistry;
- Produced oil chemistry;
- Metals composition of typical piping, tanks, vessels, and equipment showing significant evidence of corrosion;
- Samples of new specimens and corroded specimens of materials which show significant evidence of corrosion;
- Welds analysis;
- Soil and surface water samples; and
- Temperature extremes.

The objective of the Engineering Analysis and Reporting phase is to identify the major corrosion mechanisms and causes, and develop recommendations for future mitigation or minimisation of corrosion using one or more of the following options:

- Inhibitors (types, concentrations, and frequency);
- Lining materials;
- Material specifications and quality control for replacement piping and equipment;
- Changes in material handling and storage;
- Operational changes; and
- Welding/connecting techniques.

Training and a manual on corrosion will be provided to guide future operations in the area of routine monitoring, periodic maintenance, and procedures to lessen the potential for impacts due to the effects of corrosion. The corrosion assessment will use the field equipment and laboratory equipment provided as part of the proposed project.

4. Monitoring Program

The components of the monitoring program are a baseline study of initial environmental conditions, assessment of surface contamination by oil or produced brackish water, and

development of a geographic information system for environmental data and analysis.

a. Baseline Study

A baseline study of potential contamination of the field areas included in the Second World Bank loan scope will be performed. This will be a non-invasive study, in that no subsurface sampling or laboratory analysis will be performed.

The objectives of the baseline study are to:

- Identify the locations of affected areas based on visual observations;
- Document the size of the affected areas laterally at the surface;
- Describe the affected areas;
- Prioritise the affected areas for future actions; and
- Recommend future actions for the affected areas.

The baseline study will use the following resources as available to assess the field areas:

- Existing satellite and aerial photographs;
- Previous data and reports for the specific field areas regarding environmental impacts;
- Communications with selected authorities at the federal, regional, local, Production Association and NGDU levels regarding environmental impacts to the specific fields; and
- Site reconnaissance of the field areas to observe known affected areas; the site reconnaissance is to be used to determine the location and size of impacts at the surface on maps and photobases (satellite/aerial) and describe nature of impacts and possible sources.

As part of the baseline assessment, the feasibility of integrating all data collected into a GIS database will be evaluated. If such a database is feasible, it will be set up at the Production Association level and used throughout the project.

b. Contamination Assessment

The contamination assessment will be performed on an experimental scale. It is a comprehensive study of a limited area in each Production Association to determine the nature, degree and extent of impact to the air, soil, surface waters and bottom sediments, and shallow ground water from typical contaminants associated with oil and gas operations. Remediation alternatives will be evaluated and recommendations made for future actions. The results of this study will be incorporated into the baseline assessment geographic information system and used to guide future programs.

All procedures will follow commonly accepted methods used by reputable international consultants that perform environmental assessments. In this way Production Association personnel will be trained in methods of environmental assessment. This experimental project will use the following equipment provided to the Production Association: truck mounted all-terrain piston coring unit and sampling equipment, field sampling and analysis equipment, and laboratory analysis equipment.

5. Pilot Program and Training

Three experimental projects are anticipated as part of the proposed project: application of advanced remediation technology; revegetation methods; and experimental flare development. These projects will allow the Production Associations to apply modern technologies and methods to conditions at their fields and guide development of future large-scale projects.

a. Remediation Experimental Project

The objective of the remediation experimental project is to evaluate the effectiveness of existing bioremediation technologies for possible application in Western Siberia considering the short window of time available for such actions on an annual basis. The study will evaluate in-situ and onsite bioremediation options for treating crude oil impacted soils to a depth of approximately two metres on an area of up to one hectare.

Current contracts are in place for some ex-situ methods of bioremediation of soils which can be performed on a year-round basis inside warehouses. However, the in-situ/ land farming or other on-site methods will add additional capacity to soils remediation, and require much less manpower and equipment needed for ex-situ methods (excavation, transportation, treatment and deposition).

It is assumed that soil excavation equipment, farm-type ploughing and tilling equipment, and laborers will be provided by the Production Association and NGDUs. Once the area has been successfully treated, no other labor or equipment needs are required since the soils remain where treated.

This method is anticipated to be effective only during the summer months of the year; however, current techniques may be effective in treating crude oil impacted areas down to an acceptable concentration level in that amount of time. Although brine and metals impact may be present, the bulk of the bioremediation pilot study should focus on crude oil impacts.

The bioremediation experimental project will include research, bench scale, testing, pilot-scale testing, and evaluation and reporting. Research should include bioremediation under similar conditions in Western Siberia, and the effects of high salinity and low salinity as well as metals. It should make full use of Russian research data and reports.

Bench scale studies should include the following areas:

- Soil characteristics;
- Indigenous bacteria types, populations, diversity;
- Nutrients;
- Treatment times;
- Mixing and aeration; and
- Temperature and climate.

The pilot-scale study will evaluate methods in the field based on the bench scale study results and evaluate the applicability of such methods and appropriate future actions including the potential for revegetation.

It is anticipated that local labor and equipment will be used during the pilot-scale study. It is anticipated that approximately two farm tractors with ploughs, tillers and cultivation equipment, backhoe, and laborers will be needed.

b. Revegetation Experimental Project

The purpose of the revegetation experimental project is to evaluate the effectiveness of revegetating areas devoid of vegetation due to oil and gas production operations. The primary emphasis will be studies towards revegetation using indigenous plant species which show some degree of tolerance to impacts due to releases of crude oil (petroleum hydrocarbons), produced waters (brine), and mud liquids and solids (metals especially chromium). It is important to use findings from the other experimental projects into the revegetation evaluation (assessment, crude oil recovery, and bioremediation).

The revegetation project will consist of three phases; Research and Design, Field Pilot Planting, Data Evaluation and Reporting. Research and Design should include the following:

- Available data and reports on the subject of revegetation in Western Siberia and similar environments particularly related to oil industry impacts;

- Types of soils;
- Surface and subsurface hydrology;
- Geology;
- Indigenous plant species;
- Tolerance of plant species to various oil field impacts;
- Sources for supply of plant specimens that will be used during the field pilot planting; and
- Design appropriate methods, plant species, and nutrients for the field experimental project. for each test plot.

Approximately 10 sites of approximately 100 square metres each should be reserved for the revegetation experimental project within each Production Associations operating area. These areas may include areas of flooding. The experimental project should include follow up to evaluate survival rates after a winter season.

The final report of findings should include conclusions and recommendations on the effectiveness of the revegetation study, recommendations for future work and recommendations for types of plants, nutrients, and methods to use under various conditions.

c. Flare Experimental Project

The flare experimental project will provide a preliminary assessment of the current flares in Tomskneft and Yuganskneftegas only. The purpose of this assessment is to determine appropriate modifications to a current flare or specifications for a new flare as a experimental project to improve combustion and reduce emissions. Other options for reducing emissions include:

- Increase gas use;
- Avoid oil pit and spill fires; and
- Reduce gas venting.

The preliminary assessment will also evaluate the option of increasing low pressure associated gas use through firing thermal treatment equipment for hydrocarbon-contaminated soil remediation.

The flare experimental project will provide one flare or modifications to an existing flare in Tomskneft and Yuganskneftegas for the purpose of technology transfer to these Production Associations from which they can expand in the future.

The flare assessment will evaluate the current flaring systems used in the Production Associations including the types, design, and number of equipment. Appropriate parameters will be obtained and evaluated for the design of a replacement flare or modifications to an existing flare. These parameters include:

- Flow rate, pressure, gas temperature;
- Type of flare: stack, burner, assistance, smoke control, pilot;
- Availability of electricity and compressed air;
- Auxiliary equipment;
- Weather: wind speeds, temperature extremes, thermal inversions;
- Noise requirements;
- Production Association preferences; and
- Regulatory requirements for flaring systems, emissions, and smokelessness.

Recommendations will be provided for actions which should be taken by the Production Association to further reduce emissions due to venting practices and inadequate burning.

D. Costs

The environmental protection portion of the rehabilitation project is estimated to cost approximately US$5,000,000 in each Production Association for a total cost of US$15,000,000 for Tomskneft, Yuganskneftegas and Megionneftegas. Costs may vary slightly between Production

Associations. For example, Megionneftegas is not included in the flaring experimental project. However, additional assistance will be required in Megionneftegas to obtain approval to recommence drilling and production in certain areas of the floodplain due to the Decree No. 91 requirements which ceased such activities.

Included in the costs are technical assistance, training, equipment, materials, services, translations, program management, labor, and expenses. Recurring expenses are considered minimal. Costs also include estimates for Russian labor, materials, and use of certain Russian equipment to complete the project.

Table 3 presents the costs of the proposed action, by Production Association and major category. Table 4 provides a further breakdown of environmental project costs for all three Production Associations.

Table 3
Costs of the Proposed Project
(US$ millions)

Category	*Cost*
Yuganskneftegas	
Mamontovo field modernization	148.9
S. Asominskoye workovers	57.0
Prirazlomnoye in-fill drilling	52.6
Prirazlomnoye redevelopment study	15.0
Environmental protection	5.0
Total Yuganskneftegas	**278.5**
Megionneftegas	
Megion field modernization	90.0
Pokamasovskoye modernization	117.0
Pokamasovskoye redevelopment study	15.0
Environmental protection	5.0
Total Megionneftegas	**227.0**
Tomskneft	
Oil field modernization	90.0
Flowline and pipeline replacement	100.0
Sovetskoye redevelopment study	15.0
Environmental protection	5.0
Total Tomskneft	**210.0**
Total Project Cost	**715.5**

Table 4
Costs of Proposed Environmental Protection
(US$ thousands)

Category	Yugansk-neftegas	Tomskneft	Megion-neftegas	Total
Environmental Cleanup and Spill Response Equipment and Training	2,300	2,150	1,850	**5,850**
Lab Analysis, Field Sampling and Training				
Chemical Laboratory	300	300	650	1,600
Mobile Laboratory	-0-	300	600	900
Corrosion Laboratory	300	300	300	900
Monitoring and Testing Equipment	250	250	250	750
Total Lab Analysis	850	1,150	1,800	4,150
Spill Prevention (corrosion assessment)	400	250	250	**900**
Monitoring (including Assessment)	300	300	300	**900**
Total Spill Prevention and Monitoring	700	550	550	1,800
Pilot Program				
Remediation/Revegetation	300	400	350	1,050
Flare Assessment	400	300	-0-	800
Total Pilot Program	700	700	350	1,850

Table 4
Costs of Proposed Environmental Protection
(US$ thousands)

Category	Yugansk-neftegas	Tomskneft	Megion-neftegas	Total
Environmental Management and Training Plan	200	200	200	**600**
Miscellaneous				
Program Management	170	170	170	510
Translation	80	80	80	240
Total Miscellaneous	250	250	250	**750**
Total Project Cost	**5,000**	**5,000**	**5,000**	**15,000**

E. Schedule

The project will require two years to complete. It is anticipated that the project will be implemented from October 1994 through September 1996. Much of the actual work performed in Western Siberia will be done during the months of May till October in 1995 and 1996. Other aspects of the projects will continue throughout the two-year schedule.

Specific schedules for components of the environmental protection portion of the rehabilitation project are as follows:

Environmental Cleanup and Spill Response Equipment and Training: 8 months
Laboratory Analysis Equipment and Training: 6 months
Spill Prevention: 6 months
Monitoring: 10 months

Figure 1: Vicinity Map

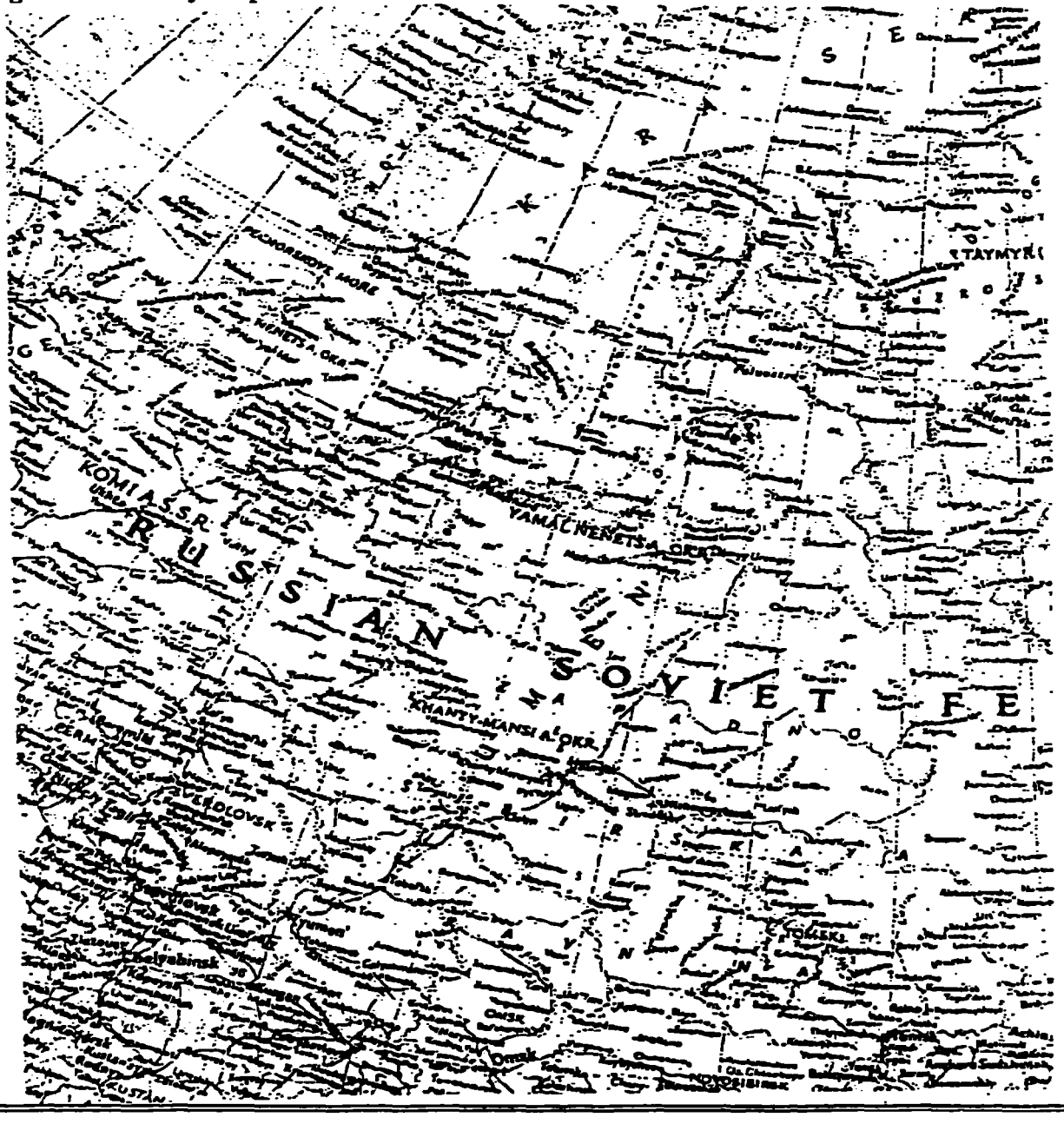


Figure 2: Administrative Okrugs

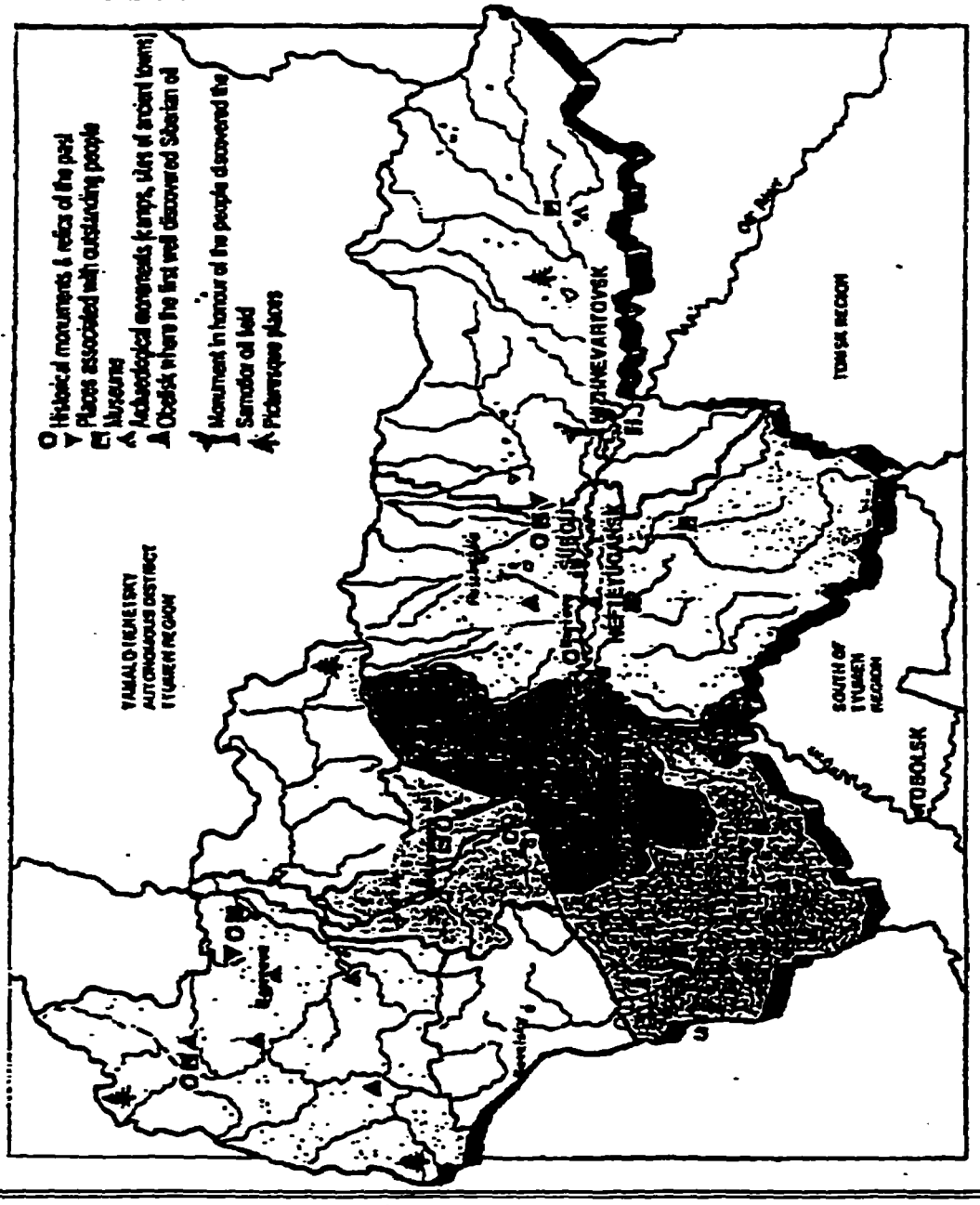


Figure 3: Yuganskneftegas and Megionneftegas Fields Location Map

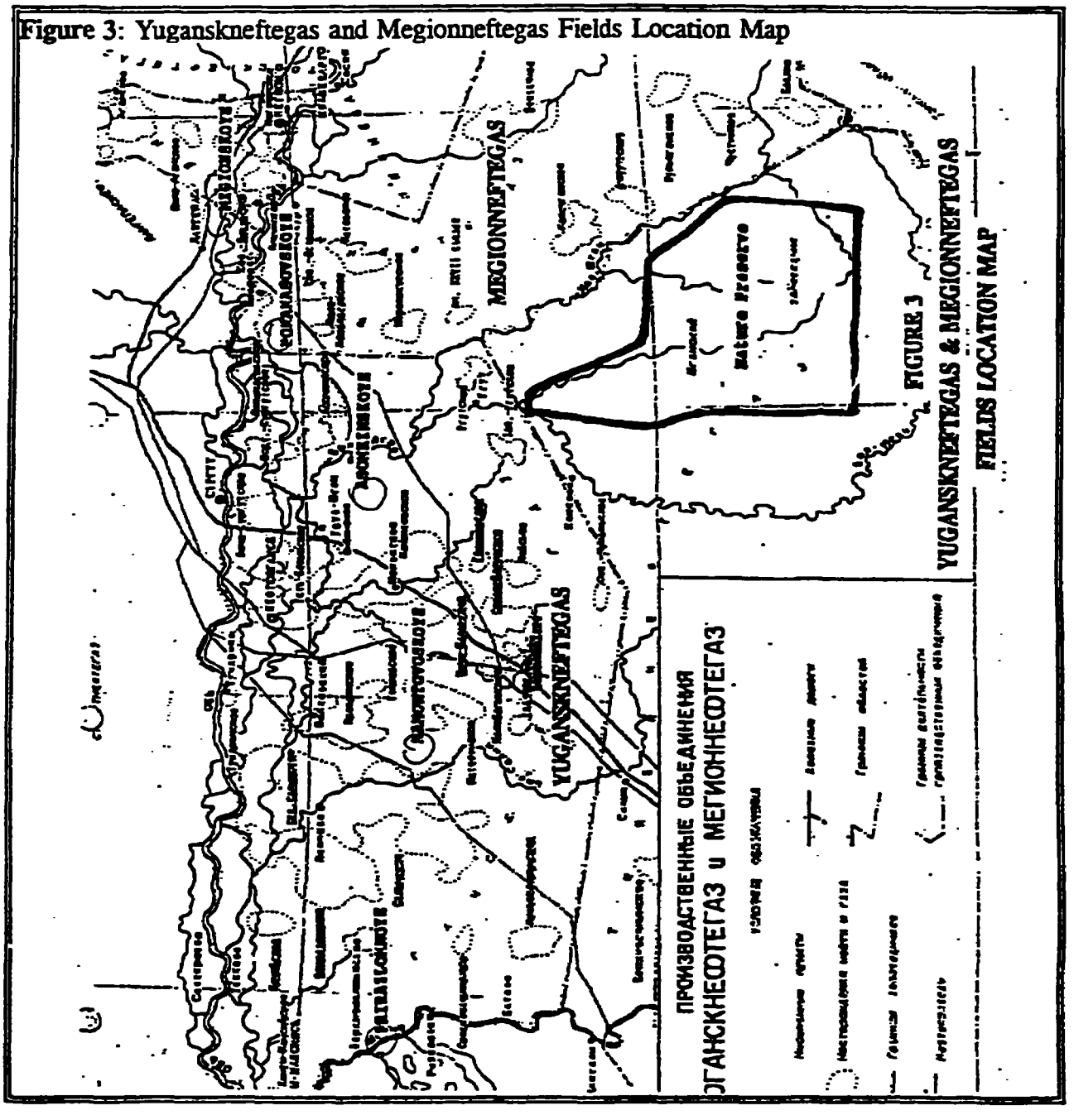


Figure 4: Tomskneft Fields Location Map

Pilot Program (including training):

Remediation - 10 months

Revegetation - 8 months

Flare Assessment - 15 months

Environmental Management Plan and Training: 14 months

Program Management and Translation: 24 months

The above schedules do not necessarily represent a continuous effort for any specific component. Some portions of a project may be inactive at various times within the two-year schedule, for example, waiting on results from a related project, waiting on equipment, or the seasonal nature of the project.

F. Responsibilities, Procurement, Monitoring and Reporting

The Production Associations are responsible for the full implementation of the proposed project including procurement of services, equipment, supplies, and monitoring and reporting. (A procurement plan is currently under development.) However, they will be assisted by the project team members and management.

CHAPTER IV
DESCRIPTION OF THE ENVIRONMENT

Western Siberia is the site of petroleum development since the 1960s. The area has been affected by production, handling and transport of oil for a long time. The primary causes of environmental impact due to the present oil and gas production operations are the following:

- Incomplete combustion of gas by flares;
- Oil spills burning;
- Venting of gases;
- Internal corrosion, causing oil spills and releases of produced fluids;
- Mud waste handling and disposal practices; and
- Design of roads, well pads, and flow line networks.

This chapter presents the existing environment, including both its natural and human-influenced aspects.

A. The Study Area

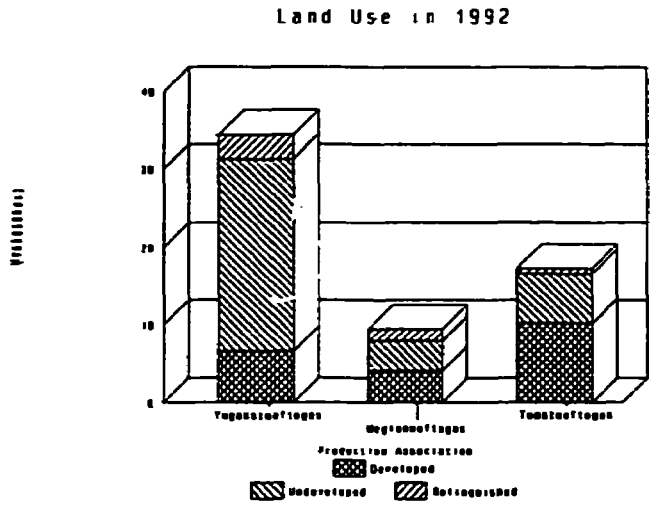
The Production Associations Yuganskneftegas, Megionneftegas, and Tomskneft are situated in the basin of the Ob River between Latitude 60° and 61° North and Longitude 72° and 80° East. The Associations adjoin each other and most geophysical characteristics are identical. Figure 4 is a map of the vicinity of the project; Figure 4 is a map of the autotonomous Okrugs in which the fields are located; and the next two figures show the locations of the eight fields in the three Production Associations Yuganskneftegas and Megionneftegas (Figure 4) and Tomskneft (Figure 4) that form the project study area.

Yuganskneftegas and Megionneftegas are located in the Khanti-Mansiysk Autonomous Okrug (district), with its capital in Khanti-Mansiysk City, of the Tyumen Oblast (region). Tomskneft

has activities in the Khanti-Mansiysk Okrug as well as in the Alexandrovsk and Kargasok Okrugs of the Tomsk Oblast.

In 1992, the Production Associations' developed and undeveloped land holdings were as shown in Figure 5. Every year the associations conduct recultivation work, eliminate oil contamination, and the so-called "lands of temporary use" are returned to former owner. The land areas relinquished in 1992 are also shown in Figure 5.

Figure 5: Lands Held and Relinquished in 1992



B. Geography

The plains of Western Siberia are the largest in the world, extending 3 million square kilometers. Much of the plains are covered with marshes and peatlands. The plains also contain some of the richest oil and gas field in the world.

Most of the territory covered by the production associations is in the Middle Ob Lowland, a poorly-drained plain lying between 150 and 170 metres elevation. This plain is characterized by slopes of less than 2%. The basins formed by these small undulations are one to five kilometers wide. Lakes and swamps are numerous in the region. The Ob River has many branches which divide the flood plain into many islands. The large river valleys generally have two or three layers of fluvial terraces. Some of the headwaters of the Great and Small Yugan Rivers and the Kulyegan River have experienced development of ravines and gullies.

The oil production areas are located in the taiga landscape type. Landscapes of the middle taiga area consist of dark coniferous forests on layered podsols and gleys. Poorly drained interstream areas consist of vast areas of fen and swamped stunted fir forests on layered podsols, gleys and peaty-gleyed soils. Seasonal subaerial frost prevails in most of the region, and to the north is permafrost. Practically the entire east-west reach of the Ob River is within the boundaries of modern active thermokarst development, mainly in the peat bogs. Potential subsidence during melting can reach 2 to 4 metres. On slopes over five percent, solifluction develops. The seasonal swelling of the ground during frost often causes hummocks of 3 to 5 metres in height and 10 metres in diameter which are characteristic of the Salim-Yugan interfluve.

The southern and southeastern part of the territory is characterized by the development of seasonal swelling and in some places of frost splitting. From north to south as the continentality of the climate increases, the possibility of frost splitting on developed lands increases.

Practically all agricultural lands of the region are located in the fluvial plains of the Ob and Irtish Rivers. The basis of agriculture is dairy and meat-cattle breeding, and the dominant land use is forage. In addition, potatoes and vegetables are grown. Hunting predominates in the non-agricultural areas.

C. Climate

The region has continental climate influenced by westerly winds in summer and the Siberian Anticyclone in winter. Severe, long winters with protracted frost periods and stable snow cover are followed quickly by cool short summers. The average January temperature is -20° to -36°C and the average July temperature is 17°C. The lowest temperature in winter falls to -50° or -55°C, the maximum summer temperature reaches 35° to 37°C. The growing season is from late May to mid-September. Frost occurs without interruption for 145 to 155 days a year. The duration of the period without frosts is 100 to 120 days. The frequency of surface inversions is about 50%, usually in winter.

Western and southwestern winds predominate in winter, with winds from the north in summer. The monthly average wind speed is about 5 to 6 metres per second. Extreme wind speeds of 22 metres per second occur on average once in five years, and winds reaching 28 metres per second occur once in twenty years.

The normal annual precipitation averages 450 to 550 mm but varies from 200 mm to 900 mm. Maximum precipitation occurs in August and September (70 to 75 mm) while the minimum occurs in February. On average, 170 to 180 days per year have rain or snow. Snow sits on the ground from late October to early May and in January is 35 to 40 cm deep. Drifting snow is about 50 days per year in the Ob valley and 30 to 40 days in the rest of the territory. The average winter snow transport can reach 200 m^3 per meter distance, and the average snow loading of horizontal surfaces is 140 to 160 kg/m^2. Relative humidity is over 80% for 2,000 to 2,500 hours per year. According to the ISO standard, the climate is highly corrosive for iron fixtures.

D. Geology

The Tyumen region is underlain by the West Siberian plate of the epipalaeozoic Ural-Siberian platform. The lower basement complex (the first structure layer) consists of metamorphic geosynclinal Precambrian and Palaeozoic rocks that are extensively folded and faulted. The depressions, synclines and graubens of the basement complex are filled with a mix of sedimentary and volcanic deposits of the upper Palaeozoic and lower Mesozoic. These form the second part of the upper basement complex. The rock thickness is 2 to 8 km.

The basement complex forms a cup-shaped depression covered with sedimentary terragenous deposits of the Jurassic, Cretaceous, Palaeogene, Neogene and Quarternary systems. They form a series of troughs and imperceptible rises whose total thickness ranges from 200 to 6,000 metres.

The oil-bearing area is in the central part of the Western Siberian platform within the Khanti-Mansi and Yugansk troughs. The basement surface of these troughs is subsided to a depth of 3.2 to 4 km. On the northern boundary of the region, a system of convergent uplifts of first-order faults and large blocks can be identified. Multistratum fields of oil and gas are confined to this system. Within this area, under a thick layer of Quarternary deposits, high Oligocene formations merge into the Znamensk horizon, which outcrops at the surface. This horizon consists of finely bedded gleys, gleyed aleurites and sands with brown coal lenses. The thickness of the horizon is 120 to 170 m.

Quarternary deposits include lake alluvial loams, sandy loams, sometimes with interbeds of buried high Pleistocene soils. Modern alluvial deposits are confined to the floodplains of the main rivers. Surface peat bogs are located both on the terraces and in the interfluves, and were formed in the Holocene.

E. Soil Resources

The mechanical composition of the dominant soils are light and medium loams. In marsh areas, peats, gleys, and podsolic gley soils are represented. In the fluvial plains of the big rivers, alluvia and meadow soils with varying mechanical composition are found. The characteristic feature of soils in the region is their hydromorphicity, reflected in surface gleying.

The background content of total oil hydrocarbons in the soils of the region is 100 mg/kg. In the Lyantorneft area of oil production in the Surgut oblast, soil hydrocarbon content is 8,300 to 22,000 mg/kg.

Radioactivity of the upper soil layer comes from artificial and natural sources and is relatively low. Natural gamma radiation emissions can reach 3 micro-Roentgens per hour. Fallout of caesium-137, caused by nuclear explosions, now forms a background level of 0.06 microcurie/m^2.

Severe soil and water contamination results when accidental discharges of oil and produced water occur due to breaks in field product pipes. About 30% to 80% of these pipelines are in sensitive environments, including bogs, lakes and streams, in multiple-pipeline corridors. These

factors can increase the risk and severity of accidents. Figure 5 shows the numbers of spills caused by pipeline failures and Figure 5 shows the estimated quantities of oil spilled in 1992 by the three Production Associations. (In 1993, 40% fewer spills were reported by the three Production Associations.)

Settling pits for spent drilling fluids and production wastes are a major source of soil and water pollution. At the end of 1992, the three associations had 1,329 active settling pits, of which 757 were in Yuganskneftegas, 232 were in Megionneftegas and 340 were in Tomskneft. The closure of pits is typically done by back-filling with soil without biological recultivation. In 1992, the Nizhnevartovsknipineft Institute compared this method of pit closure with biological recultivation. Shallow ground water around the pits indicated that chemical pollutants were oxidized after the second year of storage in open pits; the main pollutants were oil and oil products. Accurate data about oil-polluted lands are not available from the Production Associations nor the government. This is a subject of dispute; the government applies considerable penalties which must be paid by the producers from their profits.

F. Air Resources

Atmospheric pollution monitoring is carried out in the Khanti-Mansiysk, Surgut, Nefteyugansk and Nizhnevartovsk Okrugs by the Russian Federal monitoring service. These data show that the maximum pollution levels are in winter during temperature inversions and high fuel consumption. In 1992, sulphur dioxide concentrations averaged 0.012 mg/m^3, with a maximum of 0.30 mg/m^3. Nitrogen oxides averaged 0.07 mg/m^3 during 1992 and reached a peak in Nizhnevartovsk of 0.60 mg/m^3.

Atmospheric deposition of sulphur and nitrogen compounds, metals and benzopyrene in the region is low compared to other regions of Russia, but approaches or exceeds Russian standards. Sulphur loading approaches the minimal critical level for forest ecosystems of the northern part of the European territory of Russia (300 kg/km^2 per year), and nitrogen loading is even higher than the minimum critical level (280 kg/km^2 per year). The maximum deposition in the towns of Surgut and Khanti-Mansiysk were two to three times higher than the minimum critical levels.

Acid rain and snow occurs in the region. In the lower reach of the Yugan river, snow pH is consistently less than 5. To the east, acid precipitation is less severe.

Production Associations emit air pollutants into the atmosphere from discrete sources in production facilities, as well as from fugitive emissions and uncontrolled sources such as evaporation from spills. The main pollutants are sulphurous anhydride, nitrogen oxides, carbon monoxide, hydrocarbons, and particulate matter. According to the Russian Ministry of Public Health classification system, the substances emitted into the atmosphere are Class II to Class IV hazards. Table 5 shows the emissions from discrete sources such as boiler house chimneys, flares and ventilation systems, for each Production Association. In 1992, Megionneftegas had 2,947 discrete emission sources, while Yuganskneftegas had 8,768 and Tomskneft had more than 10,000.

Table 5
Air Emissions from Discrete Sources in 1992
(Metric Tons per year)

Pollutant	Production Association		
	Megionneftegas	*Yuganskneftegas*	*Tomskneft*
Sulphurous anhydride	288	726	200
Carbon monoxide	10,963	15,919	128,110
Nitrogen oxides	489	1,072	1,917
Hydrocarbons	23,919	183,027	49,671
Particulate matter	332	1,962	5,426

In addition to air pollution from discrete sources, volatile organic compounds enter the atmosphere from valves, regulators and flanges on pressure-raising pump stations of oil wells, gas well testers, and separators on group measuring devices. No estimates on fugitive emissions of volatile organic compounds is available.

Evaporation losses occur from areas where oil is open to the atmosphere, which includes oil-water separators, storage areas, transfer points, pumps, and spills. Table 6 shows local Institute estimates of the percentage of oil lost at several stages of the production process. The listed percentage is characteristic of the three Production Associations.

Table 6
Evaporation Losses from Oil Facilities

Source	*Percent of Oil Lost*
Wellheads and pumping facilities	0.002% to 0.06%
Measuring tanks	0.05% to 1.65%
Buffer tanks and settling tanks	0.16% to 0.27%
Earthen pits	9.9%
Intermediate oil gathering tanks	0.05% to 3.28%
Free crude oil	0.05% to 2.15%
Processing tanks	0.21% to 1.52%
Oil traps for wastewater treatment	0.002% to 0.02%
Storage tanks	0.05% to 2.01%

Local environmental authorities have set maximum permissible emissions for sources, calculated by applying loading factors to maximum permissible concentrations and modeling the dispersion from the source to receptors outside a buffer zone. Of all sources and causes of emissions, gas flares are the largest. Because of manufacturing imperfections, the absence of automatic level controls in oil-gas separators and incomplete combustion in flares, a large amount of particulate matter, nitrogen oxides and hydrocarbons are emitted from flares. Vegetation is often found damaged near areas of flare downwash.

G. Surface Water Resources

The Production Associations are entirely in the Ob River Basin and its major tributary, the Irtish River. The other major rivers in the region are the Great and Small Salim Rivers, the Great and Small Balik Rivers, the Great and Small Yugan Rivers, the Kulyegan River, the Vasyugan River, and the Parabel River, which flow into the Ob River, and the Demyanka and Turtas Rivers, which flow into the Irtish River. The drainage density of the region is about 0.1 km/km^2. These main rivers are mature, with substantial meandering, oxbowing, and braiding of channels. The meander displacement rate is up to several km per year. The width of the Ob and Irtish channels are between 800 and 1,500 metres in the study area. The width of the Ob River valley is about

10 kilometers, and of the Irtish River valley, 15 to 20 kilometers. Both main rivers have normal depth of 8 to 20 metres. Flow speed is 0.2 to 0.3 metres per second in normal flow and 1.0 metres per second during floods.

Ice appears on the rivers from the middle October and the channel freezes completely by mid-November. Breakup of the ice occurs around mid-May and is complete by early June. The level difference between flood and low water is about 5 to 8 metres, but in some years the difference reaches 9 to 11 metres. Peak flood levels of 11 to 13 metres can occur near the ice dams. Average flow rates of both the Ob and the Irtish are about 5,000 m^3/sec.

The region is characterized by many lakes and swamps. In Khanti-Mansiysk Okrug there are 25,300 lakes covering 1.6 million hectares. The marshes freeze at the end of October and thaw in July, but ice lenses often remain at a depth of 30 to 40 cm.

The state system of pollution monitoring conducts water quality sampling of the Ob River and its tributaries at 21 points near the Production Associations' activities. Sampling is conducted monthly or quarterly. The levels of 18 criteria pollutants are measured by Tyumen Oblast and 20 criteria pollutants are measured by Tomsk Oblast.

The natural dissolved solids concentration of the Ob River and its tributaries is low: from 87 to 270 mg/l. The average organic content (based on chemical oxygen demand) is 20 to 40 mg/l, increasing during floods up to 70-83 mg/l due to transport of organic-rich marsh outflows. Dissolved oxygen drops to zero in the winter in the Ob River and tributaries, due to the ice seal.

Pollution from human sources include oil products, phenols, nitrogen compounds and, in some cases, pesticides from agricultural activities. The average petroleum hydrocarbon content of water in the Ob, lower Vasyugan and Tom Rivers was to 0.38 mg/l in 1992, more than seven times the maximum permissible level for protection of fisheries. Near Nefteyugansk, the average concentration in 1992 was 0.79 mg/l, or 16 times the maximum permissible concentration. Much higher peak levels of hydrocarbons have been reported: Nizhnevartovsk, 4.2 mg/l; near Surgut: 3.9 mg/l; near Nefteyugansk, 2.6 mg/l; Yugan River, up to 7.5 mg/l. The annual average concentration of phenol in rivers of the region is 0.012 mg/l to 0.020 mg/l, or 12 to 20 times the maximum permissible concentration. The maximum level of phenol near Surgut in 1992 was 0.07 mg/l, or 70 times the maximum permissible concentration.

Water quality is ranked on a national index system in which pure water ranks I and very polluted water ranks VI. In 1992, the Ob River, the Vakh River and the Great Yugan River ranked V for water quality.

Aquatic communities reflect the poor water quality. In 1992, the Middle Ob River had zooplankton species that were categorized from "moderately polluted" to "severely polluted."

Water is also consumed by the Production Associations for downhole makeup water, domestic supply and other purposes. Most of this water is taken from surface sources. Up to 80% of this water is used to maintain the oil reservoir pressure and is injected into the oil formations along with the saline produced water. A small amount of water is recycled and transferred to other consumers and a small amount is lost from pipelines. In 1992, 20,120,000 m^3 of fresh water were captured from natural sources by Megionneftegas, while Yuganskneftegas obtained 103,219,000 m^3 and Tomskneft obtained 42,979,000 m^3.

Water use and wastewater disposal are strictly regulated by local authorities. In 1992 Megionneftegas generated 3,790,000 m^3 of treated sewage effluent, while Yuganskneftegas generated 7,880,000 m^3 and Tomskneft generated 12,504,000 m^3. This effluent was discharged into surface waters. The amount of untreated water that is discharged cannot be determined because there is no permanent monitoring.

H. Ground Water Resources

The region has significant resources of fresh underground water in the high and middle Pleistocene. Well production rates usually vary from 0.5 to 3.0 liters per second. Most large consumers in the oil and gas complex and in agriculture are supplied from these reserves. The method of exploitation creates problems for the supply of potable water. In addition, cross-contamination from oil wells and contamination from spills causes many wells to become derelict.

Water in the Oligocene deposits is a good source of technical and fresh water supply though reserves vary markedly according to the area. Well production ranges from is 0.1 to 10 liters per second. The depth of Oligocene deposits effectively protects the water from surface contamination.

I. Ecological Resources

The study area is in the middle taiga Salimsko-Yugansk ecoregion and is relatively homogeneous in vegetation. The dominant forest type is a coniferous canopy of Siberian cedar, pine, fir and birch. Oligotrophic *Sphagnum* raised bogs are also widespread. In the Ob River fluvial plain, marshes and meadows are found along with mixed coniferous forests.

Forests cover 35% to 50% of the region, of which only 5% to 7% are native forests. The main native tree species are birch (35% of the standing crop), pine (22% to 37%), Siberian cedar (12% to 20%) and aspen (10% to 12%). In general, mature and overage forests predominate. Siberian cedar is the most valuable commercial timber species. The fire hazard is not high. The area of forest which has been cleared for oil field operations is significant, and although no accurate estimate is available, the area taken for oil production exceeds that allocated for timber production by 30% each year. In addition, some forests show signs of stress from particulate deposition and acid rain, possibly due to gas flaring. Forests regenerate very slowly because of the harsh climate.

There is a protected forest (the Yugansk woodland) near the Megionneftegas oil fields. It is a good example of Siberian taiga landscape with a rich fauna and flora. In addition, there is a protected riparian forest in the valley of the Demyanka River that has a population of European beaver.

Other varieties of plants that occur in the region include over 50 species of medicinal plants. Berries, mushrooms, cedar nuts, pine resin, fir oil and tar are economically significant. In the high bogs are cranberries, bog whortleberries, and cloudberries.

No information is available on whether any endangered species of plants are found in the study area.

Direct impacts of oil and gas production operations include removal of flora in forests, and floodplains for construction of well pads and roadways, and damage to aquatic and wetland plants due to releases of pollutants to the air, onto the ground, and into waterways. Construction of roadways and well pads without culverts has disrupted the natural flow of surface waters and is causing inundation which changes the natural ecological characteristics of these areas. Indirect impacts include development of cities, power utilities and transportation networks to support the oil and gas industry, which clear forests and pollute air and water themselves.

J. Wildlife Resources

There are fifty species of mammals in the region, including field vole, white hare, fox, chipmunk, squirrel, sable, ermine, muskrat, otter, elk and bear. Squirrels are hunted, as are sable and musquash. Most wild species have fled the oil production areas and developed areas. Caribou are raised in the region for motive power and meat and hides.

The Red Book of the Russian Federation reports 200 species of birds in the region, of which 7 are rare. Average density of bird population in the forests is 270 pairs per square kilometer, and on marshlands, 70 pairs per square kilometer. The region is an important migration route. About 60% of occurring species are non-resident.

The waters of the Khanti-Mansiysk Okrug were until recently rich in economically valuable species of fish. Forty species have been recorded, including pike, ide, roach, perch, ruff, and carp. However, pollution has caused a decline in both fish numbers and diversity. Fish diseases are also reported to be increasing. Moreover, dredging of sand for construction of roadways and well pads has caused increases in suspended solids in the vicinity of dredging and has disturbed fish breeding areas.

No information is available as to whether any endangered animal species are found on the study area.

K. Population

According to the Census of 1989, the total population of the Khanti-Mansiysk Okrug was 1,281,396 persons. Ninety percent of the population lives in cities, and population density in rural areas is less than 0.1 person per square kilometer. Table 7 shows the populations of the major cities of the region.

Table 7
Population of Cities Near Study Area in 1992

City	*Population*
Surgut	258,000
Nizhnevartovsk	243,000

Nefteyugansk	95,000
Nyagan	61,000
Strezhevoy	60,000
Kogalym	49,000
Megion	48,000

The ethnic groups in this region are Russians, Khantis and Mansis. About 1% of the population is native Khanti and Mansi. Russians entered the area in the 16th century, established villages such as Samarovo and Surgut, and lived on trade in fish products and furs. During the 20th century, the population grew as exiled Russians were sent to Siberian gulags. The main trade shifted from commerce to agriculture and cattle breeding, and many people from different regions moved to the area. In the 1960s, the new oil industry began employing hundreds of thousands of high-wage workers and creating or adapting cities to house them, including Nefteugansk, Surgut, Nizhnevartovsk, and Strezhevoy. The early workers tended to leave the area after a few years; this trend is less apparent recently.

L. National Minorities

The original residents of the region are the Khantis. They now represent less than 1% of the total population of the Khanti-Mansiysk Okrug. In Tomsk Oblast, their number is significantly lower and they are found only in the basins of the Ob and Vasyugan Rivers. The traditional Khanti subsistence practices include hunting, fishing and reindeer husbandry. They mostly lived in small villages called "urtas" each consisting of a single extended family. Families would migrate from summer fishing grounds along the rivers to winter hunting grounds in the woods, and for that reason had two urtas. Settlements of Selkups and Nentsis are also found. Their main activities are hunting and fishing, but reindeer husbandry is also done.

Traditional living conditions for national minorities have declined in recent years due to the loss of hunting and fishing grounds and of reindeer pastures to development. Increased morbidity of reindeer, a large decrease in the number of hunted mammal and fish species have contributed to the decline. To improve these conditions, Khanti-Mansiysk Okrug has set aside an area for "priority natural resources consumption" totaling 238 square kilometers, to enable cooperatives and small enterprises of native peoples to maintain traditional ways. A 1992 Okrug decree gives

the Khanti dominant rights over about 50% of the region (but not including mineral rights). A minority community or family may receive a license to use renewable natural resources in their places of traditional natural resources consumption. However, communities with such licenses have no official documentation of the borders or extent of their territories, and so the decree may not be legally workable. Nonetheless, these patterns of national minority rights must be considered by Production Associations seeking permission to extend their exploration drilling from local authorities.

National minorities are compensated for their traditional hunting lands through house building, improvement of settlements, reform of school education, and the introduction of a compensation system at the level of each family. Nonetheless, the conditions of the native populations have not significantly improved. Land use has been changed by development of the area for oil and gas operations and related development. Many areas previously used by national minorities for hunting, fishing, and livestock grazing have been destroyed or reduced in extent, causing the people to be displaced to other areas or into the cities and towns developed to support the oil industry. However, few members of national minorities have been employed by the oil and gas industry or support industries.

M. Economic Status of the Region

The Khanti-Mansiysk Okrug is the second-highest revenue producing region in Russia, behind Moscow. The entire region is well served by the oil industry, which provides housing, stores, city services, and employment for most of the region's residents. Currently several international oil companies are establishing business relations with the Production Associations, providing substantial economic input and access to international markets.

CHAPTER V
SIGNIFICANT ENVIRONMENTAL IMPACTS

The project has the capability to prevent further degradation of the environment by decreasing the likelihood of spills and reducing pollution. The principal areas of improvement will be:

- Fewer spills of oil and produced water into terrestrial and aquatic ecosystems;
- Reduced pollution of ground water and soils due to spills and improper disposal of hazardous materials;
- Reduced discharges of drilling mud due to recycling;
- Reduced contamination of aquifers due to improved cementing of downholes;
- Reduced air pollution from flares through increased use of associated gas;
- Improved safety from installation of blowout protection and monitoring devices for high pressure and flammable gases; and
- Less contamination through use of biodegradable muds with little heavy metal content.

Significant adverse impacts to the environment may result from:

- Construction and rehabilitation of well pads, pipelines, roads, and buildings;
- Increased emissions of pollutants due to increased production of oil;
- Increased disposal of hazardous and non-hazardous wastes;
- Use of construction equipment and off-road vehicles near construction sites; and
- Dredging of rivers for sand to build roads.

In addition, the project may have indirect beneficial environmental impacts. Technology transfers and field studies that could result in improved environmental protection if results are applied. An example is the field redevelopment studies, which will determine if wells should be plugged under a future project to prevent cross-contamination of geological formations. The results of these studies, which are part of the proposed action, could lead to separately funded well plugging activities.

This chapter presents the anticipated environmental impacts, both beneficial and adverse, of the proposed action.

A. Land Use and Resettlement

No additional land will be acquired by the Production Associations for this project.

Abandoned and underused well pads will be considered for possible future drill sites to minimize the building of new pads and access roads. Abandoned pads with no potential for re-use and associated access roads will be targeted for possible future recycling to build and maintain new active pads and roadways.

All new roads that are built on fill under the proposed action will have culverts installed to allow natural drainage of water across the roadway. This will prevent adverse impacts to lands that would otherwise be cut off from natural drainage and change their ecological character and productivity.

The proposed action also includes pilot studies to assess the feasibility of measures to allow recultivation. If successful, these studies will show how to return land to productive use or to more natural states.

No resettlement is expected as a result of this project.

B. Soil Resources

The project will replace much of the corroding petroleum and produced water return pipelines with non-corroding pipelines. Implementation of the project should reduce the number of spills per year from 616 by all three Production Associations in 1993, to very few (the precise number can only be assessed during detailed project design). As a result, the introduction of hydrocarbons and salts into the environment should decline substantially.

Proper size, design, and standardized equipment for wellheads, christmas trees and downhole tubulars will reduce releases due to corrosion, unmatched threadings and couplings, inadequate pressure containment, and separation due to inadequate material strength.

Implementation of environmental cleanup and spill response procedures under the proposed action will reduce the extent of soil that is contaminated if a spill occurs. Blowout protection will prevent spills due to high-pressure losses during drilling as well as mud spills. More advanced cementing on workovers will minimize cross-contamination of soils near the well. Finally, closed-loop

mud recycling will greatly reduce the need for mud disposal in pits that could contaminate soil, and the use of biodegradable muds will reduce long-term contamination impacts to soil.

C. Air Resources

Air pollution caused by volatilization from spills will be reduced by proposed pipeline rehabilitation and blowout protection, and hydrocarbon emissions will be reduced by routing associated gas to facilities from flares to beneficial uses. Air pollution from additional well and pipeline vents, processing facilities and pump stations due to increased production under the proposed action will incrementally increase.

Quantities of pollutants emitted after the project is completed cannot be determined at this time because the specific activities that will reduce or generate pollution have not been designed. Subsequent environmental assessments for specific facilities will estimate the change in air pollutant emissions.

D. Surface Water Resources

Rehabilitation of pipelines and reduction of spill frequency and severity will reduce the quantity of oil and produced water reaching streams and rivers. Blowout prevention devices will reduce potential for future uncontrolled releases of oil and produced waters to nearby water resources during drilling and workover operations. Closed loop mud systems re-use mud liquids and thus reduce the amount of discharge to rivers and streams, and the use of biodegradable muds will reduce long-term contamination impacts to waters.

New access roads will be fitted at key locations with culverts which will maintain natural surface water flow to avoid blocking natural drainage in sensitive wetland and floodplain areas. Culverts should be designed to minimize erosional effects. In the field evaluation, existing roadways will be considered for retrofitting with culverts to re-establish the natural flow characteristics of surface waters.

E. Ground Water Resources

Replacing corroding petroleum and produced water return pipelines with non-corroding pipelines will greatly reduce the amount of contaminants that reach groundwater under the current system. Similarly, ground water will be better protected through environmental cleanup and spill response

procedures and closed-loop mud recycling that reduce the possibility that contaminants will be released to percolate into ground water.

The use of modern cementing practices and materials, designed on the chemistry of produced water and drilling and completion fluids, will significantly reduce releases to subsurface aquifers of oil, gas, produced water and drilling fluids. Also, quality cement and procedures can reduce the occurrence of subsurface blowouts from inadequately cemented intervals.

Modern equipment and procedures will reduce the amount of unrecoverable tools lost downhole in the wellbores. The potential for loss of radioactive sources in certain borehole geophysical logging tools will be greatly diminished, further protecting ground water.

The project includes an evaluation at selected fields of methods to plug or rework inactive wells. It is anticipated that wells to be plugged will be scheduled continuously until all have been plugged. Plugging will avoid present and future releases to the subsurface environment through adequately squeezing off and plugging perfed zones, productive zones, fresh water aquifers, and the near surface interval. Many workovers and recompletions will be designed to prevent subsurface releases and communications between zones by adequately squeezing-off and plugging abandoned zones.

F. Impacts to Ecological Resources, Wetlands and Biological Diversity

Field pipeline replacement will include all produced fluid lines which cross environmentally sensitive areas. Reductions in impacts from the oil and gas operations will gradually relieve impacts to flora and fauna. As hydrocarbon contamination gradually decays from wetlands and grazing lands through natural degradation, wildlife will be at less risk of damage and vegetation will reach higher productivity and diversity.

Wells to be drilled with bottom hole locations within the floodplains and wetland areas will be considered for surface locations (preferably from existing pads) outside of the ecologically sensitive areas using deviated drilling techniques to minimize additional impacts.

Sand dredging will be required to build new roads and well pads under the proposed action. This dredging will increase siltation and disturb nektonic and benthic communities in already disturbed reaches. The sand is used to build roads and well pads and to do routine maintenance. Roads

on fill will be built with culverts to allow natural drainage patterns to continue, thus protecting natural wetlands and floodplains and preserving native ecological resources.

As much sand as possible will be retrieved from abandoned locations or superfluous roads.

The proposed action includes studies of possible soil remediation methods and recultivation methods, which when implemented in a later project will more rapidly decrease the risk of ecological impacts from contamination and increase the rate of revegetation.

G. Impacts to National Minorities and Cultural Resources

Although the Khanti and Mansi peoples of the area have been displaced for oil production, they have benefited little from the development. After details are developed for rehabilitation and environmental protection projects, the Production Associations will consider involving national minorities for employment in these projects.

There are no known sacred sites or burial grounds of the Khanti and Mansi peoples in the study area.

Improvements in the quality of grazing land and wildlife habitat and declines in contamination of soil and water under the proposed action will benefit the traditional practices of reindeer husbandry and fishing.

H. Induced Development and Socio-Cultural Impacts

The project will involve some additional development of oil fields and infrastructure. Existing land holdings will be used. Appropriate training of existing labor, together with increased productivity expectations, will result in few additional personnel requirements for the execution of the project.

Sociological and cultural impacts to traditional societies may result from the proposed action. The Production Associations are sensitive to the socio-cultural aspects of the national minorities in their area and will ensure that their interests are incorporated in the project during project implementation.

I. Involuntary Resettlement

No involuntary resettlement will be conducted as part of this project.

J. Natural Hazards

The primary natural hazard affecting the study area is extreme temperature and wind. The project will be designed to withstand the rigors of the Siberian environment.

K. Occupational Safety and Health

Several measures are being proposed to improve worker safety. These measures include well blowout protection, instrumentation to alert workers of pressure changes and the presence of flammable gases, and winterized drill rigs that are shielded from weather extremes. The result should be a decrease in incidents of worker health and safety problems on new drill rigs.

L. Greenhouse Effect Gases

Ultimate emissions of "greenhouse gases" (carbon dioxide and methane) will increase incrementally as a result of increased production at the three Production Associations.

CHAPTER VI
ANALYSIS OF ALTERNATIVES

This chapter presents an array of alternative actions that would provide varying levels of beneficial and adverse impacts to the environment. Four alternatives are discussed: no action, reduced production and oil conservation, the proposed action, and an environmentally enhanced version of the proposed action that would strengthen some protection measures.

A. No Action

No action is defined as the rejection of the project for loan funding by the World Bank. The project would still be possible through local funding, although it is assumed that very little funds would be available for this purpose. The key actions under No Action are:

- Continued replacement of pipelines as they break with similar materials that are not corrosion-resistant;
- New wells constructed in the same manner as present wells, without advanced blowout protection;
- Few workover wells, performed without environmental protection;
- Continuation of current formulas of muds and no recycling of mud liquids;
- Continuation of existing gas flaring practices;
- Limited feasibility studies for field redevelopment, recultivation and remediation;
- No provision for environmental cleanup and spill management equipment, and only modest environmental management training without technology transfer; and
- No laboratories for corrosion testing or environmental monitoring.

No Action would continue the current trend of contaminating the environment with oil and produced water at pipeline breaks, failed well heads and blowouts at drill sites; contaminating the environment with drilling fluids spilled onto pads and discharged into pits; adding hydrocarbons to the atmosphere from associated gas that is incompletely combusted at flares; and subsurface contamination from improperly cemented downholes. Vegetation and wildlife will continue to be damaged from contact with toxic substances in the petroleum, produced water and drilling mud. And little planning will be performed to determine how to improve environmental protection and remedy current problems.

Furthermore, the absence of incremental revenue will determine that No Action leads to unabated degradation of the environment.

B. Oil Conservation

This alternative includes a reduced set of actions that would be required if oil conservation measures were promulgated in the Russian Federation. If the demand for oil were reduced, the need for new wells and reworking existing wells would be removed. It is beyond the scope of this environmental assessment to propose methods for oil conservation. Actions under this alternative include:

- Rehabilitation of critical parts of the present network of pipelines;
- No new well pads, roads or pits;
- Limited repairs to existing wells to remediate known environmental contamination sources;
- Use of associated gas at selected fields, and improved flares for the rest;
- Environmental management planning and contingency preparedness;
- Provision of analytical laboratories for corrosion testing and environmental monitoring; and
- Studies of remediation and recultivation.

The reduction in oil production would not significantly reduce the environmental impacts as compared to the proposed action, because the contribution of new production (under more stringent environmental controls) to environmental pollution is minor. Most of the environmental damage is related to the development of the current well field and to spills from the handling and transport of oil and fluids. Therefore, the largest contribution to environmental improvement is in repairs to the existing equipment, and this alternative does no more repairs to existing equipment than does the proposed action. Indeed, the reduced revenues of this alternative due to reduced demand and lower production may hinder the implementation of these repairs.

Environmental impacts would result from rehabilitation activities. These would be expected to be minor and temporary.

Oil conservation, if implemented, will not significantly reduce the environmental impacts of current operations over the proposed action.

C. Proposed Action - Requested Level of Environmental Protection

The proposed action has been fully defined in Chapter III. It includes new well development and reworking existing wells at higher levels of environmental protection than previous wells, rehabilitation of pipelines for oil and produced water, use of closed-loop mud systems and biodegradable mud, more gas use and improved flares, laboratories for analysis of corrosion and environmental parameters, studies of field redevelopment, remediation measures, and recultivation measures, environmental cleanup and spill response equipment and training, and technology transfer.

Environmental impacts would result from rehabilitation of pipelines and wells, construction of new well pads and roads, drilling new wells, and increasing the volume of oil, produced water and associate gas. Adverse impacts to water quality, air quality and ecological resources due to construction and rehabilitation impacts would be temporary and minor. Likewise, the increased production would have minor adverse impacts on air quality, surface water quality, soil and ground water, and ecological resources, but at a far lower level than wells constructed previously due to environmental controls for new and reworked wells. The beneficial environmental impacts of stopping spills from pipelines, blowouts, wellheads and downholes, mud recycling and biodegradable mud formulas, and improved environmental cleanup and spill response are substantial and significant.

D. Proposed Action - High Level of Environmental Protection

This alternative includes all of the actions of the proposed action and adds other measures to further protect the environment and remedy current problems. These additional measures are:

- Replace all pipelines with non-corrosive materials, rather than only the most needy segments of pipeline;
- Verify cement integrity in all active wells and re-cement deficient well holes, rather than only new and reworked wells;
- Evaluate all inactive wells for plugging or workover, and plug all wells that have no workover potential using international standards for environmental protection;
- Install pressure-sensing leak detection devices, communication systems and central monitoring systems, and automatic shutoff devices that activate when a pressure anomaly is detected;
- Increase use of associated gas, and route all remaining gas to new, high-efficiency flares;
- Install liners for all mud pits and solid and liquid waste storage pits; and

- Install lining and containment for all above-ground tanks, pumps, transfer stations, and other points where spillage is possible.
- Install culverts under existing roads where natural drainage has been blocked.

The level of environmental protection afforded by this alternative is greater than the proposed action because it rehabilitates the entire system rather than small portions of it, and adds other measures to prevent environmental pollution. This alternative would have more adverse environmental impacts associated with construction than the proposed action. However, it would result in much greater environmental benefits during operation and in contingency situations. The high-level alternative is much more costly than the proposed action.

E. Summary of Alternatives

Table 8 summarizes the significant impacts of the four alternatives for each environmental resource that may be affected by the project.

Table 8
Comparison of Alternatives

Environmental Resource	Alternative			
	No Action	*Oil Conservation*	*Proposed Action*	*High Level Protection*
Land Use	No new land	No new land	No new land	No new land
Air	Impacts from gas flares and evaporation of spills	Reduced impacts from gas flares and evaporation of spills	Reduced impacts from gas flares and evaporation of spills	Much reduced impacts from gas flares; almost zero evaporation impacts
Soil	Soil contamination from spills, mud pits, faulty well linings, lost geological probes	Substantial reduction in rate of soil contamination from spills, mud pits, faulty well linings	Substantial reduction of rate of soil contamination from spills, mud pits, faulty well linings	Almost no new soil contamination

Table 8
Comparison of Alternatives

Environmental Resource	Alternative			
	No Action	*Oil Conservation*	*Proposed Action*	*High Level Protection*
Surface Water	Pollution from spills and blowouts, mud liquids and solids; floodplain impacts from road fills; siltation impacts from sand dredging	Substantial reduction of pollution from spills and blowouts; reduced pollution from mud disposal; floodplain impacts from road fills; siltation impacts from sand dredging	Substantial reduction of pollution from spills and blowouts; reduced pollution from mud disposal; floodplain impacts from road fills; siltation impacts from sand dredging	Almost no new water pollution; improved floodplain; siltation impacts from sand dredging
Ground Water	Ground water contamination from spills, mud pits, boreholes, lost geological probes	Substantial reduction in rate of ground water contamination from spills, boreholes	Substantial reduction in rate of ground water contamination from spills, boreholes	Cessation of contamination of ground water from spills, pits, hazardous material and waste storage areas
Ecological Systems	Continued damage to vegetation and wildlife in contact with spills and contamination	Gradual improvement in vegetation and wildlife productivity and diversity; impacts to aquatic biota during dredging	Gradual improvement in vegetation and wildlife productivity and diversity; impacts to aquatic biota during dredging	Gradual improvement in vegetation and wildlife productivity and diversity; impacts to aquatic biota during dredging
National Minorities and Cultural Resources	No improvement	Improvement to traditional hunting and fishing	Improvement to traditional hunting and fishing	Improvement to traditional hunting and fishing
Social Systems and Cultures	No change	No change	No change	No change
Safety and Health	No improvement	No improvement	Improved safety during drilling and reworking	Improved safety during drilling and reworking

Table 8
Comparison of Alternatives

Environmental Resource	Alternative			
	No Action	*Oil Conservation*	*Proposed Action*	*High Level Protection*
Resettlement	None	None	None	None

CHAPTER VII
MITIGATION MANAGEMENT PLAN

This chapter presents measures to mitigate potential adverse environmental impacts of the proposed action. The mitigation plan will also point toward future projects to mitigate past and present impacts caused by actions outside the proposed action, including the current degradation of ecosystems by past pollution. The goal of the mitigation plan is not only to reduce environmental impacts for new construction under the proposed action, but also to provide a kernel of knowledge to form a basis for the Production Associations to develop a program of continuous environmental improvement in all of its activities.

Specific mitigation measures for the proposed action are the following:

- Land Use Impact Mitigation
  - Minimize the consumption of land by using existing well pads, roadways, and filled areas as much as possible and use techniques of horizontal drilling, high-angle deviation wells, and superclusters of wells
  - Route pipelines along existing roads for easier access and spill response

- Pollution Prevention
  - Develop more ways to use associated gas in production and other processes rather than flare it
  - Dispose mud solids in injection wells or abandoned wells rather than in pits or piles

- Construction Impact Mitigation
  - Flag off areas beyond the immediate construction areas to prevent vehicles from degrading more than the planned area of construction impact
  - Conduct equipment refueling away from surface waters and wetlands, and place containment dikes around field fuel tanks and transfer facilities

- Use best management practices for erosion control at construction sites
- Recycle oil pipeline materials after recovery.

► Dredging Impact Mitigation
- Recycle as much of existing sand as possible for new roads and well pads
- Place silt curtains around dredging areas
- Filter return water from suction dredging before returning to rivers

CHAPTER VIII
ENVIRONMENTAL MANAGEMENT AND TRAINING

The environmental management plan is based on the principles of prevention, minimisation, mitigation, and integration. Integration includes recommendations for establishing and coordinating a practical network of regulatory agencies, academic and research institutes, and operating companies and organizations. The plan develops practical methods to reach environmental goals in the oil and gas industry in Western Siberia within the framework of environmental regulations.

The plan will provide specific equipment, services, and training to complement current Production Association and NGDU (operating unit) efforts to improve environmental conditions associated with oil and gas production in specific areas of their operations. These systems, developed in cooperation with outside consultants and in conjunction with industry management, regulatory agencies and, acad[illegible] and research institutes, will be specific to environmental impacts associated with the oil and gas [illegible]duction industry and will be subject to regular reviews to incorporate the experience developed by the Production Associations, regulatory changes and industry developments.

A. Key Elements of an Environmental Management Plan

The Production Associations, with the assistance of experienced consultants, will:

- Establish and maintain an environmental management system as a means of ensuring that the effects of the operations of the organization conform to its environmental policy and associated objectives and targets;
- Define and document their environmental policy;
- Define and document the responsibility, authority and interrelations of key personnel who manage, perform and verify work affecting the environment;
- Appoint a management representative with responsibility for ensuring that the requirements of the standard are implemented and maintained;
- Provide awareness training for employees;

- Keep manuals and records of legislative requirements and international agreements and establish procedures for assessing environmental effects of its operations;
- Develop an environmental program;
- Develop practical environmental manuals for all levels;
- Perform environmental management audits which deal with: organizational structures, administrative and operational procedures, work areas, operations and processes, documentation, reports and records and environmental performance; and
- Perform environmental management reviews: at appropriate intervals, review the environmental management system adopted to satisfy the requirements of the standard, to ensure its continuing suitability and effectiveness.

Environmental management plans do not have to be complex, comprehensive documents. They should be workable, understandable, and easy to use to be effective. Environmental management should have a comprehensive environmental manual as a guideline; whereas field supervisors and laborers may only require brief checklists that are usable in the field.

Each procedure in the plan should be checked and double-checked by operations personnel to ensure that objectives and means are organizationally and technically feasible. Each procedure should be "re-engineered" to ensure it is as effective and efficient as possible.

Ideally, the development and documentation of procedures should be carried out by those charged with their implementation. The responsibility for environmental functions should reside with line operations.

B. Environmental Activities Already Developed by the Production Associations

To comply with regulations and to prevent, minimize and mitigate environmental impacts, the Production Associations have established a framework for environmental management which will be the basis for improvements under the proposed action.

1. Environmental Departments

In accordance with the environmental laws of Russia and the recommendations of the former Minnefteprom of the USSR, specialized departments of environmental protection were created in the Production Associations. They were made responsible for environmental protection and remediation, communications on ecological conditions to the central ministry, and coordination of measures with local and central control authorities.

At present the environmental departments of the Production Associations have increasing responsibilities with decreasing administrative staff. The enterprises, not the central ministry, are responsible for violations of environmental quality standards and remediation of environmental contamination. Table 9 lists the individuals with responsibility over environmental matters at the three Production Associations. A chief environmental engineer heads the department and employs two or three design specialists and one or two technical engineers. The department is an independent branch of the organization at the same level as the technical branch of the Association. The department plans and conducts yearly and monthly environmental protection measures. Monitoring is usually done visually as there are no instruments.

Table 9
Persons with Environmental Responsibilities at the Production Associations

Person	*Position*
Tomskneft	
Mr Vladimir A. Koltsov	Environmental Director
Mr Mikhail M. Pugovkin	Chief Environmental Engineer
Mr Gennady Kourbatov	Vakhneft Environmental Manager
Mr Alexei Shabalin	Vasyuganneft Environmental Manager
Mr Vladimir Chernikh	Strezhevoyneft Environmental Manager
Yuganskneftegas	
Mr Kazakov	Environmental Director
Mr Nikishov	Assistant Environmental Director
Megionneftegas	
Mr Victor S. Yaschenko	Environmental Director
Ms Natalya Andreeva	Nizhnevartovsknipineft Liaison

There are special laboratories in producing and research departments which analyze of water samples, air samples and sometimes soil samples. In Megionneftegas, a response crew was created to handle spills as a part of the Association's central engineering service and agricultural department. Environmental protection services are also contracted from joint-stock companies or enterprises.

2. Environmental Actions Plans

Environmental Actions Plans for five or more years, single years, quarters and months, have existed in the associations from the time of the former USSR. Long-term plans are usually coordinated with local environmental protection authorities. They are required for evaluating performance and allocating funds for specific measures. Plans of environmental actions include preparing an inventory of industrial facilities and field territory, describing

facility construction and environmental monitoring, identifying the most hazardous sections of oil field facilities replacement, planning retreatment and use of processing wastes, and planning land remediation and recultivation. The plans identify the schedule and responsible persons.

3. Scientific Research Organizations

For many years, central institutes conducted scientific research in environmental protection. In the 1980's, work on designing an environmental protection territorial scheme for the Western Siberian oil and gas complex was done by the St. Petersburg institute Lengiprogor for the former Ministry of Oil Industry of the USSR. Now, regional institutes are more widely used. The institutes conduct scientific research and design for the evaluation of the impacts of industrial activities, including calculation of maximum permissible emissions and discharges, estimation of risk and reliability, and development of environmental protection measures. The Production Associations use the following institutes to develop environmental protection sections in feasibility studies and projects:

- Nizhnevartovsiknipineft Institute (for Megionneftegas)
- Giprotyumenneftegas Institute (for Yuganskneftegas)
- Tomsknipineft Institute (for Tomskneft)

These institutes in turn use other sectoral scientific research institutes, such as Vniioeng, Vniikrneft, Vnipigaspererabotka, or the institutes of the Ministry of Natural Resources, Academy of Sciences of Russia and scientific divisions of higher schools.

It is recommended that the production associations participate in sharing the financing of sectoral scientific developments such as designing oil collectors, cleaning installations, low waste drilling processes, and preparing documentation.

4. Fire Response

The Production Associations have specific equipment and personnel responsible for responding to fires. However, whenever there is a fire, every available person needed for the response is called.

5. Spill Response Teams

The Production Associations respond to emergencies by sending available personnel who have experience with the specific problem. Some Production Associations have established a small group for such responsibility but they are generally maintenance personnel with very little training and no specialty equipment for such actions. Response to releases of crude oil usually consists of containment on land using construction equipment to build dikes, and shutting off and repairing the release source.

Spill response personnel need equipment, training, planning and coordination. These efforts should be developed closely with the present fire protection response teams.

6. Corrosion Minimisation

Currently, some Production Associations are redesigning networks of intrafield pipe to reduce the number and lengths of pipe that carry high water cut fluids. Some Production Associations have used inhibitors to reduce corrosion, but this use is limited due to high cost. Some Production Associations are using Ukrainian technologies for tank coating programs.

The primary need is to replace or protect corrosion susceptible materials which handle high corrosive fluids. However, an assessment should be performed such that the appropriate solutions to the specific mechanism of corrosion can be provided.

7. Remediation

Some Production Associations have contracted with Canadian firms to use mechanical methods to remove crude oil from land and water bodies. The primary methods are containment with dikes and booms, and recovery using skimmers and vacuum trucks. Some Production Associations have a five-year agreement with an American firm to provide both mechanical recovery and ex-situ bioremediation. The mechanical methods to recover crude oil are similar to methods used by the Canadian firms.

For every ton of crude oil recovered, a ton of soil is also to be remediated. These services include excavation of contaminated soils, transport to locations for soil washing and bioslurry treatment digestor trains, and the transport of treated soils back to the fields. A third component

of the agreement is to treat vegetation foliage in marsh areas by spraying with bacterial cultures to biodegrade the oil impacts.

8. Associated Produced Gas

Some Production Associations use most of the associated gas, while others do not. Most of the associated gas that is used is at high pressure and put into sales pipelines, or is used locally. Gas that is not used is sent to flares where it is incompletely burned contributes to air pollution.

Since Production Associations find that acquiring compression facilities to increase use of low-pressure associated gas is prohibitively expensive, the Production Associations need to explore other options to maximize use of gas.

9. General Environmental Protection Activities

Environmental protection activities of associations is done to fulfill Federal laws, sectoral ministries and the requirements of local authorities. These activities are conducted through a framework of organizations which develop and introduce current and prospective environmental protection plans, including mitigation of previous negative impacts.

C. Development of Environmental Management and Training Plan

In their effort to comply more closely with the legislation of the Russian Federation and international agreements, the Production Associations will develop more comprehensive Environmental Management systems, coupled with an operations manual, to involve all levels of operations to successfully reduce impacts to the environment.

The Production Associations have already developed environmental plans. The environmental management plan for this project will be handled by the existing environmental departments of the Production Associations and NGDUs with the assistance of consultants.

The components of the Environmental Management and Training Plan are:

- Environmental cleanup and spill response equipment and training
- Training and technology for subsurface contamination assessment (experimental project)

- Training and technology for crude oil recovery from shallow ground water (experimental project)
- Training and technology for soil bioremediation (experimental project)
- Training and technology for corrosion prevention (experimental project)
- Training and technology for low-emission flares (experimental project)
- Equipment and training for analytical laboratories and field sampling and monitoring
- Environmental baseline study
- Environmental monitoring plan

The environmental management and training plan will be performed by the Environmental Departments of the Production Associations and NGDUs (operating units) with the assistance of a team of international specialists. It is anticipated that each area listed above will be implemented by a team consisting of a project manager, an assistant, and approximately seven technical experts in one or more fields. Additional specialists will assist with setting up major equipment and provide training to Production Association and NGDU personnel.

The experimental projects will provide specific equipment, services, and training in field assessment, crude oil recovery from shallow ground water, bioremediation, revegetation, corrosion,and flares. Based on the results of the experimental projects, recommendations will be made for future actions.

Local Production Association and NGDU personnel will be an important part of experimental projects as a means for promoting training and technology transfer, and adding valuable local experience and technical expertise to the projects.

It will be crucial to the overall success of the project for each experimental project team to maintain frequent communication and provide data to all other experimental project teams, such that all experimental projects will benefit from the work of all teams involved. During selection for the experimental project sites, consideration should be given to the potential for flooding in certain areas in the spring to mid-summer months.

There are many obstacles to the Production Associations towards achieving adequate environmental protection, including:

- Numerous old well stock;
- Low-quality surface processing oil-field equipment;

- Large areas of pollution;
- Volume of work for new facilities construction;
- Deficiency of financing for environmental protection measures;
- Lack of technical facilities; and
- Lack of communications with local population and environmental protection authorities in understanding of oil and gas production and maintaining of environment.

The associations will improve their equipment and operating procedures, level of environmental knowledge of their employees, knowledge of the environmental legislation and regulations, and benefit from the experience of other oil producing countries, especially in similar climatic conditions.

Environmental protection services of the associations should intensify contacts with the local population which must be enlisted not only as the observers, but as the workers on oil producing facilities.

The recipient of the second oil rehabilitation loan financing must establish a system to improve communications with the federal level for estimation of environmental impacts, and specific remedial actions to improve the state of the environment using appropriate technical means: mechanical, chemical and biological.

1. Environmental Management Manuals

Manuals will be developed to assist the Production Associations develop standardized procedures for environmental management. Such manuals will be developed to incorporate current regulations at the federal, regional and local level as they relate to oil and gas production operations. The manuals are:

- Operational practices manual (simple and practical) covering issues such as drilling, workover, production, gas processing, equipment and facilities quality assurance inspection and preventive maintenance (before installation and regularly once installed), record keeping and reporting, underground protection, waste handling, with particular attention to drilling mud wastes, chemical storage and containment, spill prevention, control and countermeasures, spill detection, contingency planning and response, dredging and mining of sand fill, abandonment procedures (including post-abandonment care and maintenance, and restoration work;
- Quality control manual (equipment and installations); and

- Health and safety manual, covering hazard assessment and communications, accident reporting, safety data sheets, warning labels, and procurement use and maintenance of personal protecting equipment.

Improvements to the environmental protection service structure in the associations is recommended, including providing computers and other equipment for effective communications with other horizontal and vertical organizations, including Federal authorities. That would sharply reduce the ecological concern of the Associations within the bounds of Environmental Protection Law of the Russian Federation and responsibility of the enterprises for economic activities in conditions of market relations.

2. Field Redevelopment

Guidance for field redevelopment will be prepared as part of the project. This guidance will stress the prevention of environmental damage and the minimisation of impact. It will cover:

- Optimization of use of natural resources;
- Integration of environmental consideration in the design of physical facilities (in particular consider natural surface water flows in the design and construction of roadways, well pads and surface facilities);
- Detection of system failures and control;
- Baseline environmental study before the redevelopment starts; and
- Consultation with appropriate non-governmental organizations and national minorities.

3. New Field Development

For development of new oil fields, guidance incorporating many of the aspects of this project will be prepared. The objective is to include, up-front, environmental considerations in the design and operation of the new field. The guidance will include:

- Optimal criteria for siting;
- Environmental planning considerations, to integrate environmental features with design factors;
- Environmental baseline inventory and monitoring; and
- Consultation with affected parties.

4. Other Recommended Elements for Environmental Management

To bring this plan to fruition, we believe it will be necessary to thoroughly involve all key actors in the industry and to generate enthusiasm and commitment through active participation. Among the ways in which this can be accomplished, we envisage the following:

- The creation of an Association of the Environmental Managers of the Production Associations and NGDUs of the region. This association could perform the following functions:
  - Update regulatory information
  - Disseminate information
  - Provide support for permitting and licensing
  - Develop and maintain an information database
  - Communicate with the administration on global issues
  - Share experience and assure effective technology transfers
- Revive the local Petroleum Institute and assist it in the development of links with international petroleum institutes. This Institute might:
  - Assess new technologies in oil exploration and production
  - Assess new developments in environmental protection techniques and technologies
  - Perform special studies for the Production Associations
- Link the state, local and Production Association monitoring systems to ensure that the different programs complement one another (optimization of resources);
- Enhance communication between existing research institutes to ensure that the immense knowledge and data resources are effectively shared and optimized;
- Make better use of the knowledge acquired by the local Environment Committee through the use of the "Ecological fund"; and
- Create a system of self-assessment for those Production Associations that do not participate in the Second World Bank Loan.

This approach will enhance the coordination and co-operation among central, regional and local authorities, the existing institutes and the oil and gas industry. They will result in a common approach to resolving environmental issues and will promote more sustainable development in the region, thus satisfying the needs of the present generation without sacrificing the resources upon which future generations will depend.

CHAPTER IX
MONITORING PLAN

Environmental monitoring will be adapted to each Production Association's specific conditions. Each Production Association will have different priorities set annually as part of a 3 to 5 year revolving plan, including:

- Baseline study: for each field addressed in the Second World Bank loan, environmental data should be gathered, using in particular satellite and aerial photography as well as ground observations, and entered into a central database using modern technology;
- Geographic Information System: due to the size of the areas covered by the Production Associations, GIS technology should be used. Such a system would allow the integration of the field design data and the environmental data. The implementation of such systems should parallel the efforts of control authorities in the overall monitoring of the region.

An experimental project in this field would include the following stages:

- Review the current needs;
- Establish geographic locations of key features, facilities and environmental impacts;
- Scan and integrate aerial photography and satellite images;
- Integrate field design drawings;
- Convert and integrate any available digital data;
- Develop and create of digital terrain models;
- Applications development; and
- Train users of the system.

The laboratory facilities program, using the equipment described in the previous section and in coordination with existing certified laboratories. Such a program would include:

- Sampling and testing of water, air, oil, formation water, gases and soil;
- Support to Remediation Pilot Plan;
- Selection of chemicals used in field operations; and
- Corrosion testing.

CHAPTER X
INTER-AGENCY AND PUBLIC/NON-GOVERNMENTAL ORGANIZATION INVOLVEMENT

Extensive meetings and discussions were held with Russian government agencies at all levels and public interest groups to determine their views on the project. The following list describes the meetings that were held, what was discussed, what role the parties have in the project and the environmental approval process, and what their main concerns are in regard to project impacts and benefits. Unless otherwise stated, all meetings are between the indicated persons and Tyumen Task Force representatives.

July 27, 1993 Meeting with Siberian Research Institute of Geology, Geophysics and Mineral Resources; Dr Stanislav Golyshev.

Concerns of the Siberian Institute about the project:

- High concentration of Fe, Ca, phenol in ground water - from where?
- Natural gas seapages contaminating ground water
- Much chemical plant activity upstream Ob and Irtysk
- Migration potential of radio-active waste from Tomsk nuclear facility

August 3, 1993 and October 11, 1993 Meetings with Russian State Centre Priroda: Dr Vladimir Kisilev, Deputy Director; Anatoli Rubakha and Vladimir Suschanya, to work with Priroda on Tyumen Region Rehabilitation Studies; in Moscow.

Concerns of Priroda for the project:

- Capabilities in satellite information gathering on technogenic and anthropogenic damage to the region
- Ground oil contamination findings with aerial photos
- Biochemical clean-up techniques and baseline surveys

October 12, 1993 Meeting with Water Management Committee of Russia: Vladimir Lisischkin, in Moscow.

Concerns about the project and the role of the Committee:

- conservation issues of the Ob/Irtysk river system, sand, water unsafe
- oil and gas developments inside the floodplains
- transportation on rivers
- interface with their regulatory bodies

November 8, 1993 Meeting with Mr. Vaver, Deputy Head of Nizhnevartovsk Ecological Committee (reports to the Okrug Committee headed by Mr. Dollinger).

Main issues discussed:

- Organization of the total Ecological Committee and Links to Okrug Committee and Ministry of Environment;
- Inspection and control;
- Schedule of fines to companies and management of companies;
- Priorities in terms of environment;
  - oil and water spill prevention
  - mud pit remediation
  - atmospheric emissions
  - monitoring of the environment.
- Role of Ecological fund, financed by the fines;
  - possible help to PA's in their environmental efforts
- Importance of the monitoring and efforts of the committee to monitor their area (127,000 square kilometers).

In a follow up meeting held on January 31, 1994, the following was done:

- Review of draft report;
- Information on monitoring systems;
- Coordination of environmental activities with local committee;
- Importance of local environmental committee in the environmental review procedures and in the permitting process.

November 15, 1993 Meeting with Mr. Vekilov, Head of the Environmental Department of ROSNEFT, State Enterprise Holding of Production Associations.

Main issues discussed were:

a. The priorities i.e.,:

- flow lines: breakdowns due to corrosion;
- emissions to atmosphere due to associated gas;
- mud pits and waste;
- water utilization;
- control over the state of the environment;

b. The lack of understanding between the local and the federal level in the administration and the need for more coordination.

c. The actions to be taken, i.e.,:

- technical modernization;
- monitoring;
- remediation starting with oil spill clean up and remediation programs;
- monitoring of gas emissions;

d. The access routes to reliable information and the difficulties to get it.

In further meetings with Mr. Vekilov, held on November 29, 1993 and on January 28, 1994, the following points were addressed:

- Measuring the effects of technological involvement;
- The importance of a comprehensive environmental plan at PA level;
- The drop in environmental awareness and the need for training;
- The need for the PA's to do a precise environmental assessment as the project gets better defined;
- The importance of the new directives on National Minorities and in particular:
  - the allocation of land
  - the need to help them develop their traditional activities (hunting, fishing, deer breeding and berries collection)

  - The need to rationalize agreements between PA's and National Minorities when PA's exploit oil on their territories.

- The importance of using local institutes and national specialists in the further help to the PA's;
- The importance of monitoring the implementation of a program such as the 2nd World Bank Loan;
- The importance of having access to technological know-how;
- Possible national use of the ecological funds.

November 15, 1993 Meeting with Mr. Eugeni Konygin and Mr. V.A. Trikonov of the Ministry of Environment. Mr. Konygin was then counselor to the Minster and Director of the project preparation and implementation unit for World Bank projects (his functions have changed since then).

Items discussed were:

- The priorities in the environmental situation of Western Siberia and specifically:
  - find ways to minimize spills;
  - minimize emissions to atmosphere;
  - cross boundary issues.
- The position of MINPRIRODA in the environmental assessment process;
- The role of the monitoring agencies;
- The role of the local environmental committees;
- The board panel on environmental issues created in 1990.

In further meetings held on November 30, 1993 and December 2, 1993, the following were addressed:

- The utilization of ecological funds;
- The sustainability of the Federal Monitoring System (levels of monitoring have dropped);
- The implementation of sectoral environmental programs;
- The dissemination of information;
- The weakness of the enforcement system.

November 30, 1993 Meeting with Serguei A. Bourtsev, MINPRIRODA, Deputy Head of State Department of Environmental Assessment and Review.

- Explanation of the State Environmental review process: the EA's are reviewed at local and regional level and the ministry makes final judgement - 40,000 EA's had to be reviewed in 1992.

December 2, 1993 Meeting with Mr. Andrei Peshkov, Head of the Institute of Natural Resources, MINPRIRODA and Senior Advisor to the Minster on Certification and Licensing and Protection of Biodiversity:

Main discussion on:

- Licensing process;
- Environmental impact assessment requirements;
- Execution of the legislation in the present evolution in Russia;
- Protection of wild species;
- Preservation of protected territories;
- State scientific centers and the need for cross fertilization with them (world wide experience).

December 2, 1993 Meeting with Victor Gunnin, Deputy Director General of GOS Center Priroda, Federal Service for Geodesy and Cartography of Russia.

- On GIS capabilities in Russia;
- On access to thematic maps using space photography;
- On the development of criteria (environmental indicators) for environmental monitoring;
- On international environmental standards.

December 2, 1993 Meeting with Mr. Vsevolod V. Gavrilov, Director of the Federal Center of Governmental Systems, MINPRIRODA.

- Importance of training;
- Decree 943 of January 24, 1993, concerning the organization of state ecological monitoring system;
- Organization of Goscompriroda, measuring effluent and emissions of industrial companies;

- Organization of the State Center of Hydrometeorology, monitoring air, water and soil and checking in respect to standards.

In a further meeting held on January 27, 1994, the importance of coordinating the monitoring at PA, local, regional and national level was stressed.

January 12, 1994 Meeting with Mr. Minaev, Head of the Department of Environmental Protection and Natural Resources Management at the Ministry of Fuel and Power (MINTOPENRGO) discussed the following:

- Main Concerns:
  - gas emissions: Mr. Minaev's position is that in field development, gas collection and utilization should be part of the cost of oil production and utilization should be found locally. (diesel engines, electricity generation, heating);
  - waste pollution: minimize releases to water and ground and act quickly on these;
  - minimize usage of river waters for injection;
  - environmental assessment before any development and start before development;
  - Adequacy of Russian standards but poor implementation and lack of effective enforcement;
  - importance of training for equipment brought in through 2nd World Bank Loan;
  - importance of taking all environmental considerations before the spending starts;
  - design a training program for the PA's (active training);
  - train Russian experts in international programs so they can train their own people.

In a further meeting with Mr. Minaev held on January 29, 1994, the following was discussed:

- Remediation of mud pits: something has to be done about it;
- Recommend more usage of gas locally;
- Develop the right biochemical agent for soil reclamation;
- Importance of the right social services for National Minorities;
- As this is a rehabilitation project, all territories on which the project takes place have already been allocated to PA's.

January 27, 1994 Meeting with Mr. Yuri Maximienko, Head of the Department of Environmental Legislation and Regulations, MINPRIRODA.

Discussion on:

- changes in legislation taking place at the moment, and in particular the law on environmental assessment that changed on December 14, 1993;
- standards for emissions and discharges of pollutants, utilization of natural resources, licensing and permitting, and environmental impact assessment;
- important steps to take for project to be implemented according to schedule.

In a further meeting with Mr. Maximienko held on February 4, 1994, the new directive on mineral resources was discussed.

February 1, 1994 Meeting with Natlya Andreeva, deputy head of NizhnevartovskNIPIneft (oil institute).

- Capabilities of institutes to provide project decision-making support;
- Development of environmental indicators;
- Modeling of the impacts of industrial activities;
- Optimization of field design for future developments;
- Work done for region Megionneftegas (modeling and simulation of environmental impacts for redevelopment of Pokamaiskoye Field) and for Tomskneft (environmental assessment of Vakhskoye Field).

February 2, 1994 Meeting held at Khanti-Mansiysk with:

Mr. Gennady Tikhonov, Vice Chairman of the Okrug Soviet
Mr. Vladimir Karasev, Deputy Head of Administration and of the Department of Natural Resources Use
Mr. Valerii Churilov, President, Yugra
Ms. Tatiana Novashina, Head of the Scientific Department of the Okrug
Mr. Alexander Kondryev, responsible for Okrug heritage fund creation
Mr. Kabarlov, of Yugra company, advisor on environmental technologies.

The main goal of the meetings was to review the draft report on the Second World Bank Loan. The main issues discussed were:

- Preservation of natural resources;
- Organization structures of monitoring;

- A joint venture that the Okrug, Langepasneftegas and a California company are presently setting up;
- Coordination of activities of PA's with actions of ecological committees;
- Dissemination of information stemming out of such programs;
- The new powers of the Okrug in relation to management of natural resources;
- The licensing procedure (balance of power between Okrug, MINTOPENERGO and ROSCOMNIEDRA, the state committee on geology);
- The Okrug regulations relative to environmental issues;

February 2, 1994 Meeting with:

Mr. Michael Lazarev, Deputy Chairman of the Committee for Indigenous People

Mr. Alexander Petrovich Danshin, local representative of the Federal Committee for Northern People

Mr. Gannady Karipanov, responsible for Social Security Policy:

Major issues discussed:

- Impossibility of license without agreement with local population;
- Legislation protecting National Minorities;
- Traditional activities of National Minorities;
- Health problems of National Minorities;
- Agreements with Oil Companies;
- Investment fund for National Minorities;
- Suggestions for well being of National Minorities.

February 2, 1994 Meeting with Khanty-Mansiysk Autonomous District Committee of Environmental Protection and Natural Resources; Mr Viktor N. Makeev, First Deputy Head of Committee; in Khanty-Mansiysk.

Items of concern to the Khanti-Mansiysk District Committee of Environmental Protection:

- An environmental fund was established on July 16, 1992, for environmental protection measures. The fund was allocated for 60% local use, 30% Okrug use, and 10% for implementation of federal programs. In the first three quarters of 1993 approximately 5 billion Rubbles were available for the Khanty-Mansiysk Okrug use. However, recently

the director has transferred the fund into the overall budget. Therefore, it is not clear whether these funds will remain strictly for environmental protection measures.

- The environmental committees are under the direct authority of the Russian Federation Ministry of Environmental Protection and Natural Resources and are organized at three levels: regional/territorial such as the Khanty-Mansiysk Okrug Committee, local/city committees, and rural committees. Essentially the rural committees have less authority, but the regional/territorial and local/city committees have equal authority. This means that enterprises which are seeking approvals for projects may have to meet requirements of several different levels of committees with possibly contradictory requirements.

- The Khanty-Mansiysk Okrug Environmental Committee currently have 289 employees including three certified laboratories for analysis of samples obtained on routine or inspection basis.

- Disagreements between the enterprises and Committee requirements are handled within arbitrage court.

- At the Okrug level, the committee consists of the chairman, first deputy, and the following departments:

  State environmental expertise
  Economies of environmental use
  Air protection
  Water protection
  Flora/fauna protection
  Procurement
  Land resources
  Finance
  Lab analysis
  Hydrometeorography

- In 1989, the Khanty-Mansiysk Okrug Environmental Committee began environmental monitoring. However, they do not have a systematic database for such information. They plan to set up a committee to monitor the World Bank Second Loan Project once the project has been authorized.

- The committee has entered into joint venture with companies for the following objectives:
- Development of a plant for internal and external coating of pipe
  Recuperation of oil from soil surfaces using a liquid absorbent that does not mix with water. The joint venture is with Sarasol of California and involves applying a fluid to the surface of the soils which absorbs up to 99% of the oil. The fluid can be recycled up to 20 times after the oil has been extracted. The future plan is to eventually set up a local manufacturing facility to produce the fluid and to construct the centrifuge units used to separate the soils, water, oil, and fluid.
- Insulation of downhole tubulars using a "glue" process to coat the well column to minimize communication between subsurface petroleum production zones and water-bearing zones. This joint venture with an American firm, DME. This joint venture was developed to address one of the major concerns of the committee which is the large number of idle wellbores which potentially are avenues for communication of petroleum fluids into water-bearing zones.

SUMMARY OF ISSUES DISCUSSED:

The result of all the meetings held in Moscow and in the region can be summarized as follows:

Major concerns of the population:

- Emissions to atmosphere through gas venting and faring - (adding the fact that the faring scare the fauna and is a major factor in pushing them out of the oil fields);
- Releases to water, flood plain and ground;
- Mud pits and releases of oil field chemicals;
- Industrial infrastructure needed for oil production;
- Impacts of the above on air and water pollution levels and on fauna and flora (in particular deforestation and scarcity of fauna in present oil fields;
- National Minorities.

Most important priorities in environmental activities:

- Minimize releases;
- Minimize emissions, through associated gas utilization and/or efficient flare design;
- Remediate mud pits;
- Clean up surface oil in new or past oil spills;
- Find acceptable solutions for remediation and recultivation in polluted areas;

- Design a monitoring system for improvement of environmental conditions in existing fields and control of all future activities;
- Design comprehensive environmental plans and manuals;
- Design comprehensive training programs for industrial concerns;
- Develop sound environmental practices in field design to minimize environmental impacts of field developments;
- Change of mentality towards the National Minorities: the development decisions now. have to integrate the concerns of the National Minorities;
- Moscow can no longer supersede decisions of the Regional Authorities;
- Consideration for National Minorities is now real, after thirty years of "oil at any price";
- Traditional activities of National Minorities;
- Legislation to protect the rights of National Minorities;
- Access of National Minorities to the joint-stock oil companies;
- Investment fund for National Minorities;
- Health problems of National Minorities.

ADDITIONAL IDEAS DEVELOPED IN THESE MEETINGS:

- Create an environmental monitoring system at territorial level (Western Siberia) and split the responsibilities between PA's and the local, regional and federal institutions involved in the issue;
- Create an association of environmental managers in the region for dissemination of information and training;
- Seek scientific support from universities;
- Develop the environmental departments of the local oil institutes (NIPIneft) so they can assist in technological improvements, specialized knowledge (such as GIS systems) and training;
- Require a yearly report on the state of the environment in the production associations;
- Promote utilization of associated gas as principal source of energy in the region (gas fired vehicles, electric power and heat in particular);
- Accept technological improvements in lieu of fines;
- Promote environmental service companies that can be regional and service all oil companies;
- Institute a system of environmental insurance;
- Improve reliability of equipment (develop standards);
- Ask for a study on detection and safety equipment for future oil developments.

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In preparing this environmental assessment, the following people were consulted:

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APPENDIX 2
RECORDS OF INTER-AGENCY AND PUBLIC/NON-GOVERNMENTAL ORGANIZATION COMMUNICATIONS

APPENDIX 3

3.1 Data and Unpublished Reference Documents

Note: This appendix expands on the text presented in Chpater II, Section D.

Structure and Responsibilities of Environmental Bodies in the Russian Federation

In Russian Law "On Environmental Protection" (which was adopted September 19, 1991) lays down the functions of the special empowered state (federal) bodies of the Russian Federation in the field of environmental protection, and/of the Republics and autonomous entities in the Russian Federation, of territories, regions and local self-government bodies.

1. Federal Legislation Bodies

In Russian Constitution (Basic Law), adopted by the Referendum December 12, 1993, says that the Supreme Legislative Body of the Russian Federation is the elected Federal Assembly.

According to the Law "On Environmental Protection", the Federal Assembly sets the main directions for the state policy in the field of environmental protection and determines the basic relations in this field.

The new Constitution of the Russian Federation says (Article 72 D) that the Russian Federation and the subjects of the Federation jointly have, within their responsibilities:

- land use, environmental protection and ecologic safety;
- territories under special protection;
- the protection of history and culture monuments.

They also jointly have control on land, water and forest legislation, legislation on the mineral resources and on environmental protection.

To draft legislation on environmental protection and in nature and natural resources fields and to have these issues taken into account in other legislative acts, the Federal Assembly will include a Committee on the Ecology and a Committee on Natural Resources.

The State Prosecutor's Office of Russia, with a Department controlling compliance with the ecological legislation, is directly subordinate to the Federal Assembly.

In regions, autonomous areas cities and city districts, these bodies are represented by environmental prosecutors, who check compliance of enterprises and citizens with environmental legislation, and who can take companies and citizens to criminal court for such violations.

2. Supreme Executive Power in the Russian Federation

Basing its work on the above mentioned law, the government of the Russian Federation implements the state eco-policy, securing work on state eco-programs and their implementations, coordinates the work of ministries, agencies and other organizations on the territory of the Russian Federation in the field of environmental protection.

Besides, falling within the competence of the Russian government is the setting of the order to work out and confirm ecological standards for emission of hazardous substances into the environment. The government also determines pay and the limits of pay for using natural resources, for contaminating the environment, and for storing refuse. The Council of Ministers of Russia includes a Department for nature use, ecology and for protecting the health of the population (headed by Vitaly Parfionov).

3. Territorial Self-Government Bodies

The Law of the Russian Federation as of March 5, 1992, "On territorial and regional soviets councils of people's deputies and territorial and regional administration" (at present new representative bodies (Dumas) are being formed to replace Councils of People's Deputies, which will take up in full the functions of the former Soviets Councils) sets the levels of competence in the field of nature use.

The territorial and regional Soviets and the territorial and regional administration checks the rational use of natural resources and the protection of the environment in reference to the objects of federal property. The territory and region may have in its ownership plots of land, mountain land, and other natural objects (including water reservoirs, forests, etc).

The territorial and regional Soviet forms territorial and regional extra-budgeted funds, which use fines for contaminating the environment and for other violations of eco legislation, sanitary

norms and rules on the territory of the area and region, and also, payments, with set-off the inflicted damage. These fines and payments are used to carry out nature protection and environmental improvement efforts.

Within their competence, the territorial and regional Soviets

- set the borders for territories with a special legal regime, based on corresponding projects, and in coordination with a corresponding local Soviet;
- confirm territorial and regional programme on the rational use of land, on improving land fertility, on protecting land resources in a single complex with other environmental protection efforts;
- set the order for supplying plots of land for objects of federal and inter-regional importance, for the construction and broadening enterprises, which are owned by the territory or region, and , also, of plots of land set aside for orchards, vegetable gardens and animal husbandry by people living in cities;
- set the maximum size of plots of land, offered to citizens for life and hereditary use without fine limits (permanently) or for temporary use, given to be property or for rent;
- decides which natural objects situated on the territory of an area or region are natural objects under protection.

4. Local Self-Government Bodies

The Law of the RSFSR "On local self-government in the Russian Federation" as of July 6, 1991, sets the competence of bodies of local self-government in Russia. Local (territorial) self-government is the Russian Federation is a system for organizing the work of citizens to make independent decisions on issues of local importance, proceeding from the interests of the population.

Town and village Soviet (in line with the Russian President's Edict, the work of former Soviets of People's deputies at the level of regions and towns is handed over to regional and town administrations):

- determines the rules for using natural resources in line with existing legislation, makes decisions on stopping the construction and exploitation of objects in case of violating eco, sanitation, and construction norms on the territory within the competence of the Soviet;

- bans projects, which may lead to unfavorable eco changes in the demographic situation and other negative consequences on the territory within the Soviet's competence (bans are based on appropriate conclusions of the RSFSR State Sanitation and Epidemiological Service, and of the RSFSR State Committee on the ecology and nature use).

The town and village administration:

- registers property rights on land. rights for land use, land ownership, agreements for temporary use of plots of land and agreements on their rent;
- receives payment for land;
- carries out state control over the use and protection of lands;
- on its territory, controls adherence to environmental legislation, adherence to the rules for hunting, fishing, collecting mild plants, fruits, berries, etc.;
- makes decisions on imposing fines for the harm done to the environment in line with the existing legislation.

Regional Soviet:

- bans projects which may cause unfavorable environmental consequences, changes in the demographic situation or any other negative consequences on the territory within the Soviets competence (such bans are based on conclusions of the RSFSR State Sanitation-Epidemiological Service and the RSFSR State Committee on the ecology and nature use);
- sets the rule for using water intake construction, intended to satisfy the people's needs, and determines the areas for sanitary protection of water objects in line with sanitation demands;
- selects local objects which are of ecological, history or scientific value, which it will announce natural, history or cultural monuments, sets the rules for their protection and use.

Regional Administration:

- Suspends the construction or the exploitation of industrial sites in the case of a violation of environmental, sanitary or construction standards on the territory under the responsibility of the Soviet; limits or forbids the industrial use of drinking water;
- Collects payments on lands;
- Carries out State controls on the use and the protection of lands;

- Controls the implementation by land users of all obligations on land melioration, fight against erosion, recultivation of damaged lands, planting of trees to protect fields, on the territory of the region;
- Organizes the system of land use, and gives its opinion on the system of land use planning implemented on the territory of the region;
- According to the relative legislation, manages and controls the use and protection of water, forests, mineral resources, atmosphere, flora and fauna, and other natural resources on the territory of the region;
- Authorizes the use of water resources of the region, arbitrates discussions on the use of water, in the limits of its responsibilities, controls the construction and the exploitation of water supplies as well as the irrigation and the melioration of these constructions;
- Determines the functioning of mineral deposits quarries located in the territory of the region;
- Arbitrates discussions on the use of mineral resources in the limit of its responsibilities;
- Guarantees the implementation on the territory of the region of measures to protect the environment, controls hunting, fishing activities as well as the gathering of natural plants, fruits, berries, etc.;
- Carries out environmental expertise on projects, sites in construction, companies, which pollute the atmosphere and water basins, and which do not guarantee the efficient functioning of their purification systems;
- According to the legislation, decides on fines for damaging the environment.

5. Federal Executive Bodies

5.1. The Russian Federation Ministry for the Protection of the Environment and Natural Resources

The Ministry for the Protection of the Environment and Natural Resources (Minister: Victor Danilov-Danilian) is the representative body of the Russian Federation in the field of environmental protection. Its responsibilities are the following:

- Combined management of the environmental protection in Russia;
- State control on the use and protection of land, mineral resources, surface and underground water, atmosphere and other natural resources, and also on the implementation of environmental safety standards;
- General organization and coordination of environmental monitoring;
- Confirmation of standards, rules, as well as participation in the development of standards regulating the use of natural resources and environmental protection;

- Carries out state environmental expertise;
- Authorizes the storage of industrial as well as household waste;
- Takes measures if the exploitation violates the environmental protection legislation or if it exceeds standards;
- Takes legal action for damages resulting from the violation of the environmental protection legislation;

The Federal Environmental Fund is submitted to the authority of the Ministry. This body collects a part of environmental payments, fines and other receipts. It also finances environmental projects at the Federal level.

5.2 Other Federal Ministries and Departments for the Protection of the Environment

The September 22, 1993 Decree N 943 of the Council of Ministers of the Russian Federation establishes that the Ministry for the Protection of the Environment and Natural Resources of the Russian Federation, together with its territorial bodies, in the limits of their responsibilities, coordinate the activities of other special representative State bodies in the field of protection of the environment and their own territorial bodies, that is to say:

a. The Russian Federation Committee for Geology and the Use of Mineral Resources, which is responsible for:

- Controlling the environmental safe use of mineral resources and its protection;
- Delivering licenses for the use of mineral resources;
- Monitoring the geological environment, including the observation of the quality of underground water, exogenic and endogenic geological processes, and preventing underground water from pollution and exhaustion.

b. The Russian Federation Committee for Land Resources and Systems of Land Use, which is responsible for:

- Controlling the use and protection of lands, monitoring of lands, the system of land use and the cadastre (register of land);
- Expertising programs and projects relative to the development of the right to property, the land use and a rational use and protection of lands;
- Delivering licenses for land use.

c. The Russian Federation Committee for the Fishing Industry, which is responsible for:

- Managing the fauna and flora of national water reservoirs;
- Protecting and meliorating fish reserves. and regulating the fishing industry;
- Delivering specific licenses for industrial activities.

d. The Russian Federation Committee for Water Economy, which is responsible for:

- Ensuring the provision of the populations and farmers needs in quality of water;
- Regulating the relationship between subjects of the Federation using water and the protection of water.

e. The Federal Service for Geodesy and Cartography, which is responsible for:

- Responding to the needs of the population and of State bodies information on (geographical, numerical and cartographical) localization;
- Working on geological information systems.

f. The Federal Service for the Russian Forest Economy, which is responsible for:

- Managing the use, melioration and protection of forests;
- Controlling the respect of the forest legislation.

g. The Russian Federation Service for Hydrometeorology and Environmental Monitoring, which is responsible for:

- Organizing State monitoring on environmental (chemical and radioactive) pollution, including the control of water pollution by means of hydrobiological indicators;
- Providing State bodies, companies and the population with general and emergency information on the environmental situation and on dangerous environmental changes.

On top of the above, the Ministry of Environment works hand in hand with:

The Russian Federation State Committee for Sanitary and Epidemiological Control, which is responsible for sanitary control:

- The localization of industrial activities, the choice of land parcels for the construction or reconstruction of enterprises;
- The choice of water sources and vacation areas as well as measures to protect water resources from pollution;
- Measures to protect the atmosphere from pollution;
- The gathering, neutralization and storage in discharges of industrial and domestic waste;
- The organization of special expertise on projects relative to civil and industrial construction; it also carries out expertise on projects setting up sanitary protection areas, and decides on the conditions for the use of water.

The Russian Federation Ministry for Civilians Rescue, State of Emergency and Eradication of Natural Disasters Consequences, which is responsible for:

- Controlling the environmental situation and its improvements;
- Managing exceptional environmental situations;
- Forecasting potential incidents and catastrophes on industrial sites and on transport networks.

The State Department for the Hunting Economy, which is responsible for:

- Controlling the rational use of the hunting economy, and delivering hunting licenses;
- Making decisions to increase the productivity of the hunting economy.

All the Federal bodies mentioned above have their own sections at regional level (in this particular case, in the regions of Tyumen and Tomsk) and at district level (here, the Khanti-Mansiysk district). The Federal bodies we have examined have their own structures or representation at regional level. Moreover, most territorial and local structures are submitted to a double authority:

- At vertical level, to Federal bodies of the executive power;
- At horizontal level, to the regional administration (i.e., the government of the autonomous district).

6. Regional and District Committees for the Protection of Nature under the Russian Federation Ministry for the Protection of Nature

The republic, district and regional bodies coordinate the protection of nature on their own territories and gather all information relative to the protection of nature. They include the following sections:

- Economic ruling of the use of nature;
- State environmental expertise;
- Laboratories of analysis and logistical departments;
- State environmental control;
- Cadastre (land register);

The republic, regional and district Committees for the protection of the environment are responsible for;

- The recording and evaluation of natural resources, the condition of natural resources, and the recording of damaged areas;
- The recording and evaluation of the volume of industrial waste on the regional territory;
- Environmental expertise on projects carried out on their territories;
- State environmental control, decisions about the limitation, suspension and interruption of the economic activities of a company, if they do not respect the environment protection criteria;
- Not authorizing the construction of industrial sites potentially dangerous for the environment;
- Delivering licenses for the use of natural resources, for emissions of dangerous substances, for the disposal or the burying of waste.

7. Local (city, regional) bodies for the protection of the environment under the Russian Federation Ministry for the Protection of Nature

Independent city and regional Committees were set up in the different cities of the region. Their functions were defined by local authorities and the regional Committee. Inter-regional Committees were also set up in a number of regions. They have to carry out State environmental controls in a number of districts. Local (regional) environmental authorities are responsible for:

- Recording and evaluating the environmental situation on their territories;
- Carrying out environmental expertise and State environmental controls;
- Recording and evaluating the volume of industrial waste;
- Delivering authorizations for specific uses of nature, the emissions of dangerous substances, and the burying of toxic waste;

- Making decisions regarding the limitation, suspension or interruption of activities threatening the environment.

8. Environmental Services within Firms

Companies using natural resources or which activities affect the environment, set up special environmental Services (department). The functions of these Services are:

- Controlling the implementation of plans and measures to protect the environment and to promote a rational use of natural resources;
- Guaranteeing the respect of environmental quality standards and environmental legislation. They are under the authority of official environmental bodies;
- Environmental monitoring, observation of the volume of industrial releases, accidents, and waste;
- Gathering analysis and summarizing data relative to companies activities as far the use of natural resources and environmental pollution are concerned.

Competent Ministries and Departments also include sections (directions, departments). They have to coordinate the activities relative to the protection of the environment and they also carry out preliminary expertise of TEA (Technical and Environmental Augmentation).

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