NORTH SUDAN FUELS 2004

A survey, with recommendations, of the situation for fuels in the context of United Nations humanitarian and peacekeeping operations for the Darfurs Region and relevant parts of South Sudan supplied from the North

This report was compiled by the UNJLC Fuel Consultants Mr. Iain Kinnear and Dr. A R Shulli during August 2004 and relates to the conditions that existed at the time. It was completed with the assistance of Mr. John Levins.

The authors extend their deepest appreciation to the UN agencies and offices, non-governmental organisations, government organisations, aid agencies, members of the Sudanese oil and fuels industry, including Nile Petroleum, Nile Bakri, Petronas, and Shell, and the Government of the Sudan without whose kind assistance this report would have been impossible. Each of these organisations gave freely of information and advice to the extent that they were free to do so, and provided invaluable advice to the authors on various aspects of the Sudanese oil market.

Copies of this report are available at www.unjlc.org or through the UNJLC Office in Khartoum, located at the UNDP premises, Gamma'a Avenue, PO Box 913, Khartoum, Republic of the Sudan.
EXECUTIVE SUMMARY

United Nations operations in Sudan – both current humanitarian operations in the Darfurs and future peacekeeping and expanded humanitarian operations in the south - will require fuels support far in excess of that available through Sudan’s domestic refining industry. Substantial overland imports from neighbouring countries are not practicable. This presents the Organisation with a major challenge. Not only must it import large quantities of mostly aviation fuel by sea through Port Sudan whilst ensuring the requirements for successful mission accomplishment in the far west and south of Sudan, but it must also avoid introducing price instability within the Sudan fuels market that can harm sustainable growth in the country.

Although Sudan has developed over the past five years into an important mid-level oil producer and exporter, its current and planned domestic refining capacity is geared only towards meeting current and future local needs for fuels, with a slight surplus of gasoline for export. That refining capacity cannot be increased quickly enough to respond to the UN’s needs, nor would it be wise to do so; given the temporary nature of the UN’s presence in the country, Sudan would be left with costly and unused excess refining capacity.

REQUIREMENTS: The two major fuel requirements for the UN and humanitarian community are aviation fuel and diesel. The needs of the current humanitarian mission to the Darfurs with a very limited African Union military element totals about 10 million litres of Jet A-1 aviation fuels and two million litres of diesel per month. This is currently supplied through a combination of locally refined product from Khartoum’s Jafiri Refinery, the El Obeid Refinery, and imports through Port Sudan by the main contractor, Shell, in conjunction with the Government’s Sudanese Petroleum Company. Additionally, WFP’s local contractor, Matthew Petroleum (Sudan), buys local product to supplement the imports. The fuels are transported over distances of up to 1600 km to users in the field.

The UN’s peak aviation fuels requirement is equivalent to about half of the country’s total output of Jet A-1. The diesel is less contentious, with needs met by local production and imports on a much lesser scale.

Requirements will increase significantly once the peace agreement with the south is implemented. With overall UN peak monthly requirements expected to be in the region of 20 million litres for aviation fuel and six million litres for diesel against Sudan’s average monthly production of about 18 and 168 million litres respectively, we strongly recommend that all major fuel requirements for the UN are imported. Sudan’s own fuels production should be reserved for its domestic transport, power generation, agricultural and other needs. Planned increases in that production should serve much-needed economic growth in the country and not the UN’s demands.

CONTRACTING ARRANGEMENTS: The task of importing such large quantities of fuel and distributing them to where they are needed, in some of the most remote parts of the country, requires careful centralised management, planning and prioritisation, attention to detail, and robust execution. It demands a transparent and effective tendering process and a high level of co-operation between the Government of Sudan, commercial entities within the local fuels industry, and the UN agencies and associated organisations. We therefore recommend the establishment of a Joint Fuel User Group, chaired by a senior representative of the Minister of Energy and Mines, with the deputy chair (or co-chair) a senior representative of the UN.

We further recommend that these imports be implemented under a single, integrated fuels contract, focussed initially on the current and pressing needs of the Darfurs humanitarian operations, but covering the later needs of the peacekeeping operations and increased UN humanitarian operations in the south, the ICRC and other humanitarian players. Such an integrated arrangement will avoid different parts of the UN family competing against each other with commercial suppliers for the same resources, thus driving up prices and possibly creating an uncontrolled market. The size of the single contract – estimated at in excess of US$100 million annually for Jet A-1 aviation fuel alone - will also allow the supplier to realise economies of scale unavailable in several smaller contracts and to pass these savings on to the UN family.

Furthermore, using several smaller contracts may render it uneconomical for individual suppliers to install facilities to service the UN. The throughput of a large contract would help to justify infrastructure investment by the supplier, thus relieving the UN of the need to construct, manage and later decommission its own facilities.
EXECUTIVE SUMMARY (cont’d)

We recommend that the contract is managed on behalf of the entire UN family by one UN entity specifically responsible for the job and charged with taking into account and if necessary reconciling the specific requirements for both the humanitarian and peacekeeping functions of the UN.

DISTRIBUTION and SUPPLY: Even with imports, the vast distances between the import point at Port Sudan and the users, together with the parlous state of the transport infrastructure, renders sustained and reliable direct supply impossible. We therefore recommend that 30 days strategic storage is established and run commercially within easy access of the key towns of El Obeid, Kosti and Kadugli in the States of Northern Kordofan, White Nile and Southern Kordofan respectively. Large road tankers can efficiently move bulk quantities on good all-weather roads to these locations; smaller, more robust tankers can then take the fuel forward to operational locations. Such a system, combined with smaller 7-day or more buffer stocks in the field, will allow supply or demand fluctuations to be readily absorbed. The strategic stocks should be held on a prepaid basis so that ownership is undisputed and the supplies appropriated by the authorities in time of crisis.

At present, the transport infrastructure necessary to supply the needs of the anticipated peacekeeping operations and expanded humanitarian mission in the south does not exist. However, if the market is made aware of the size and nature of the need in good time, experience from previous large importation operations suggests that it will be able to respond adequately to the requirements with imported road fuel tankers.

RECOMMENDATIONS: This is a dynamic and very large operation, quite possibly of several years duration, with the immediate needs of the Darfurs driving the requirements. Our major recommendations are therefore phased accordingly:

Short-term: immediate through to end of October 2004

- World Food Programme, the major user of fuels at present, to engage a second fuels contractor at El Fasher and Nyala, the respective capitals of Northern and Southern Darfur, so as to immediately boost operational capacity. This should be a short-term, stop-gap solution;
- The UN to initiate a Joint Fuel User Group with the Ministry of Energy and Mines, other concerned Sudanese Government Ministries and authorities, the UN humanitarian agencies and other humanitarian actors, and the Department of Peacekeeping Operations;
- The UN entity so tasked with fuel management (herein referred to as “UN”) to formalise the fuels requirement (utilising existing tenders as a starting point), factor in the requirements of all UN agencies, issue a Statement of Requirements, and commence the tender process.

Medium-term: November 2004 through to February 2005

- UN to appoint a contractor, or consortia of contractors;
- UN to establish a 24-hour operations centre with the successful contractor or consortium;
- The WFP, ICRC and other existing fuels supply contracts to be merged and integrated with the new, single contract;
- A Memorandum of Understanding be agreed between the UN and the Ministry of Energy and Mines, Special Operations Group, covering the direct importation of fuels by the contractor or consortia for UN and associated use;
- All contractors’ installations be inspected and formally classified by qualified, accredited inspectors to certify them suitable for aviation fuel usage.

Long-term: Beyond early 2005, into early 2006

- Negotiations be conducted with the Ministry of Energy and Mines on the possibility of reversing the current benzene (gasoline) export pipeline from Khartoum to Port Sudan (formerly an import pipeline) to import aviation fuel and diesel and carry it from Port Sudan to Khartoum, once the second product export pipeline from Khartoum to Port Sudan, currently under construction, is completed.
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1. **Scope and Aims**

The scope of this survey is to review and document the existing and required fuel logistics supply chain for the humanitarian and peacekeeping community operating or expected to be operating in North and West Sudan in the foreseeable future. These operations include:

- Existing humanitarian operations in the Darfurs region of Western Sudan;
- The increased presence of African Union Mission in Sudan monitors and troops in the Darfurs, supported by the UN’s Department of Peacekeeping Operations (DPKO);
- The expected increase in humanitarian operations in South Sudan subsequent to the implementation of the peace agreement between the Government of Sudan and the Sudanese People’s Liberation Movement/Army (SPLM/A);
- The expected deployment of UN peacekeeping monitors and/or forces to South Sudan, again subsequent to the implementation of the Government of Sudan, SPLM/A peace agreement;

The survey was limited to North Sudan and neighbouring countries from which fuel may be supplied overland. This report does not address the issue of fuel supply to those areas of South Sudan outside the direct control of the Government of Sudan. A separate report on this is available on [www.unjlc.org](http://www.unjlc.org) or through the UNJLC Office in Nairobi, Kenya.

The general aim of the survey is to provide a clear understanding of the fuel logistical challenges arising from these operations and to identify ways in which the fuel logistics co-ordination may be strengthened.

Specific aims of the survey are to:

- Clearly document the existing strategic supply chain for fuels serving humanitarian operations in or from North Sudan, including potential and existing capacity limitations and bottlenecks, so as to provide humanitarian and peacekeeping organisations with a clear understanding of the fuel logistical challenges arising from an expansion of their operations in Sudan. Operations from North Sudan include those areas of South Sudan directly controlled by the Government of Sudan;
- Identify, if possible, practical recommendations for eliminating or ameliorating capacity limitations;
- Estimate the fuel dependencies (user requirements) and assist in facilitating the supply of such requirements from the Government of Sudan, through imports sanctioned by the Ministry of Energy and Mines;
- Identify how the humanitarian community may be more effectively served for fuel logistics, including improving the effectiveness of commercial arrangements, enhancing the logistics planning process of the respective agencies and organisations, and further assisting them to optimise their logistic support;
- Provide practical recommendations for how a strengthened logistic coordination structure may be developed within the humanitarian and peacekeeping community, including optimising the use of facilities and combining purchasing power; and
- Identify, if possible, for the United Nations and the relevant civil authorities of the Government of Sudan, ways in which fuels can contribute to the economy of Sudan and the well-being of its entire people, with consequent reduction on the dependency on humanitarian aid together with achievements of the Millennium Development Goals.

The survey was conducted over the period from 3rd August through 3rd September 2004 by Mr. Iain Kinnear and Dr. AR Shulli. In Khartoum, visits were made to the Ministry of Energy and Mines, the Ministry of Aviation and its subsidiary body, the Civil Aviation Authority, and members of the local fuels industry including Greater Nile Petroleum Operating Company, Nile Petroleum Company, Nile Bakri Petroleum Company, Petronas, and Shell. Field visits outside Khartoum were made to Juba in South Sudan; Nyala, El Fasher and Geniena (the respective capitals of the three Darfur states); and El Obeid, Kadugli and Kosti, being major operational bases for humanitarian or peacekeeping operations.
2. Assumptions and Methodology

Assumptions used in this report are that:

- The Peace Agreement between the Government of Sudan and the SPLM/A will be signed and implemented in the year 2005;

- Implementation of the agreement may involve a large UN peace supporting element being deployed in South Sudan, supported logistically from both the north (Port Sudan, Khartoum and towns controlled by the Government of Sudan south of Khartoum) and the south (through Kenya and Uganda, notably from Entebbe International Airport);

- The humanitarian community’s operations in the Darfurs will continue for at least another year;

- Sudan’s domestic grounds fuels consumption, exclusive of demand created by the UN presence, will grow by 8% in 2005;

- Sudan’s domestic aviation fuels consumption will grow by 6% in 2005;

The methodology employed entailed examining the aggregate demand of the domestic Sudanese economy and that imposed by the presence of the United Nations family, including the DPKO. We then examined what sources of supply were available within and outside Sudan to cover that demand and further demand arising from the anticipated economic growth of the country. The next step was to look at what storage in Sudan could be available to the UN to use for buffer stocks, together with means of distribution (i.e. fuels transportation) to build and retain those stocks. Finally, we looked at ways of reducing the UN demand through greater fuel efficiency and other major factors such as weather that could impact on the mission and its fuel requirements.

ILLUSTRATION OF METHODOLOGY USED IN STUDY
3. Industry Background.

3.1 Overview

As a mid-level oil producer, with an expanding indigenous refining industry, Sudan has become potentially self-sufficient in all its fuel requirements during the past five years. However:

- the long-running conflict in the South between the Government and the SPLM/A has meant that fuels for areas outside direct Government control are usually supplied through Kenya or Uganda;

- rapid expansion in the country’s power generation infrastructure in recent years, using gas turbine electricity generators in order to bring that capacity online quicker than would have been possible using thermal power stations, and to reduce the country’s overdependence on hydroelectric power has greatly increased local demand for diesel fuel to the point where it must import at present; and

- the significant increase in humanitarian operations this year in response to the emergency in the Darfur region has created additional temporary demand – particularly for aviation fuel and diesel - beyond that which the local refining industry can meet in the short term. This has and will continue to necessitate the use of imports specifically to meet the needs of the humanitarian community.

The reliable supply of fuels is essential to the continued success of humanitarian operations in the country.

3.2 Upstream Exploration and Production

Petroleum exploration in Sudan began in the early 1960’s, originally concentrated offshore in the Red Sea. The only significant discovery was *Chevron’s* (now ChevronTexaco) 1976 Suakin gas find. Further onshore exploration in the 1960’s and 1970’s led to several discoveries in central-south Sudan near the towns of Bentiu, Malakal and Muglad. However, in the 1980’s, as a result of fighting in the area between the Government of Sudan forces and the SPLM/A (during which members of exploration crews lost their lives), Chevron abandoned its concessions and later withdrew from the country in the early 1990’s. French-Belgian oil major *TotalFinaElf* (then TOTAL) also suspended its onshore exploration activities further south of Chevron’s area but retains its concession to the present day.

In the early 1990’s, non-US foreign oil exploration firms began to return to or enter Sudan for the first time to resume activities, particularly in the central area. The Government sub-divided Chevron’s former concessions into smaller exploration blocks. In time, a consortium headed by Canadian independent *Arakis Energy* acquired a concession to one of these in the Muglad Basin north of Bentiu in 1993, began development of the oil fields, and brought them onstream in 1996 at around 2,000 barrels per day (bpd) as part of the *Greater Nile Oil Project (GNOP)*. This was Sudan’s first major oil production, all of which was consumed internally. Development by Qatar’s Gulf Petroleum Company in the Melut Basin, to the west of the GNOP area, brought further production of 10,000 bpd onstream by mid-1998. By then, Sudan was producing a modest total of no more than 20,000 bpd.

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2 Sudan’s main hydroelectric power plant at present is reported to be the 280MW plant at *Roseires* on the Blue Nile 500 km southeast of Khartoum. A slightly larger 300MW plant, financed largely by China, is under construction at *Kajbar* on the Nile’s second cataract but the major addition to hydroelectric power capacity will be the Arab-financed 1250MW dam at *Merowe*, on the Nile’s fourth cataract, about 400 km north of Khartoum. Until this major plant is operational in mid-2008, Sudan will have to continue relying on electricity generated by burning fossil fuels.

3. Gas turbine power generators (which burn natural gas or diesel) can usually be installed and operational in a matter of months, although they have a relatively modest output. Thermal power stations, which usually burn more abundant (and cheaper) crude oil or heavy fuel oil, as well as natural gas, take several years to build but have a higher output. Hydrocarbon fuelled electricity generation plant is necessary in Sudan as its hydroelectric (river dam) power plants are subject to the vagaries of seasonal rainfall and river flow. Sudan does not yet have the natural gas infrastructure that would provide the most effective fuel for the gas turbines and other power generation so must rely on diesel.

4 Suakin is an historic island, 58 kilometres south of Port Sudan. A slightly larger 300MW plant, financed largely by China, is under construction at *Kajbar* on the Nile’s second cataract but the major addition to hydroelectric power capacity will be the Arab-financed 1250MW dam at *Merowe*, on the Nile’s fourth cataract, about 400 km north of Khartoum. Until this major plant is operational in mid-2008, Sudan will have to continue relying on electricity generated by burning fossil fuels.

5 The members of the *Great Nile Oil Project*, represented by Greater Nile Petroleum Operating Company (www.gnpooline.com) are presently China National Petroleum Corporation (40%), Malaysia’s Petronas (30%), OVL of India (25%) and Sudan’s Sudapet 5%. In October 1998, Arakis was purchased by another Canadian independent, Talisman Energy. In October 2002 Talisman sold its Sudan oil assets to ONGC Videsh Limited (OVL), a subsidiary of India’s state-owned Oil and Natural Gas Corporation.
3. Industry Background (cont’d)

3.2 Upstream Exploration and Production (cont’d)

Concessions were let in mid-2004 to Pakistani-led consortia for exploration on Blocks 9 and 11, in the area immediately north and south of Khartoum. No production yet.

Most of Sudan’s current oil production comes from the Heglig and Unity fields in the Muglad Basin on Blocks 1 and 2. These concessions, together with Block 4 (which came onstream recently), are owned by the Greater Nile Petroleum Operating Company consortium. Production is transported by the country’s only operational major crude oil pipeline to the El Obeid and Khartoum refineries, with the bulk exported through Port Sudan.

West of the Heglig and Unity fields, near Al Foula, more production is coming onstream from Block 6 (partly in Southern Darfur) in which China also holds the major interest. A crude pipeline is being constructed to take this oil to Khartoum refinery, where processing capacity is being doubled this year.

East of the Heglig and Unity fields, in Blocks 3 and 7, a third major area is coming onstream, with Petrodar. This will involve a third crude pipeline direct from the area to Port Sudan for export.

In the south, TotalFinaElf and its partners hold a concession over a huge 120,000 sq km block centred around Bor. On-the-ground exploration was stopped about twenty years ago with the civil war, but is most likely to restart in the near future. As yet, there is no production from this area. Any pipeline to export crude found here may, however, pass through Kenya.

Further development of the GNOP and other oil blocks has taken place and a 1,540 km crude oil pipeline from the fields to Port Sudan commissioned in 1999, allowing Sudan to now produce in excess of 300,000 bpd, mostly for export. Production is mainly from the GNOP’s Heglig and Unity fields in Blocks 1 and 2 of the Muglad Basin where the concessions are now held by Chinese, Indian, Malaysian and Sudanese Government oil interests. American companies are prevented from entering the industry because of US sanctions on Sudan.

The map above illustrates the allocation of blocks and concessions as of the first half of 2004. Since then, Block 9, surrounding Khartoum, has been leased to a Pakistani company, Zafer, who holds 85%, with Sudapet holding the balance of 15%. Block 11, to the west and south-west of Khartoum, has been leased to another Pakistani-led exploration consortium. Significantly, these two blocks represent the first time that major oil exploration concessions have been granted in North Sudan. To date, all exploration has been in the centre or south, and all production has come from the centre.
3. Industry Background (cont’d)

3.2 Upstream Exploration and Production (cont’d)

Development is also being undertaken on Blocks 5A and 5B by Malaysia’s Petronas and India’s OVL. These areas are adjacent to and south of the GNOP concessions and, security permitting, may be readily connected to the GNOP Heglig/Unity-El Obeid-Khartoum-Port Sudan pipeline, which starts only 75 to 100 kilometres from the 5A and 5B oilfields.

East of the GNOP area, the Petrodar consortia is pursuing the Melut Basin Oil Development Project in Blocks 3 and 7, centred around the Adar-Yale field, discovered in 1981, in the states of White Nile and Upper Nile. This project is expected to be producing up to 170,000 bpd by the end of 2005, and 300,000 bpd by the end of 2006.

To the north-west of the GNOP area, new Chinese-owned fields in Block 6, centred on Al Foula, are expected to yield 120,000 bpd by 2005, and 170,000 bpd in 2006. Much of Block 6 lies in Southern Darfur.

TotalFinaElf and its partners continue to hold a concession in the south where it is not yet considered safe to resume exploration work. They have, however, been reprocessing seismic data gathered in the 1980’s using more modern techniques. It is expected that renewed exploration will recommence in these areas in the next year or so. Any discoveries may take up to a further two years to be brought into production.

National production is expected to increase to between 350,000 and 370,000 bpd in the near future as new wells and new fields come onstream. The Sudanese authorities expect that production in 2005 will average in excess of 500,000 bpd, and rise to around 750,000 bpd by 2006. Other industry estimates, perhaps optimistic, suggest a figure of 900,000 bpd within three years or even one million bpd by the end of the decade, all from fields that are either producing now, or where active exploration is being undertaken. This includes the effect of the inevitable decline in GNOP production from Blocks 1 and 2, anticipated in 2005 at the earliest. Such a level of production would place Sudan in the league of Australia, Colombia, Egypt, Malaysia, Oman or Qatar as an oil producer, ahead of Brunei or Syria.

At present, natural gas produced together with the crude oil is largely flared off. This associated gas – together with deposits of unassociated gas - represents a valuable resource which, if harnessed, could be used for power generation (thus reducing the reliance on diesel), for clean cooking fuels, or even export.

The sanctions first imposed on Sudan by the US in November 1997 on the basis that oil profits were being used to fuel the civil war in the South and Sudan’s alleged support of terrorism (and extended to the Greater Nile Petroleum Operating Company in February 2000) are still in place. Even if they are lifted in the near future, the time required to implement the required legalities means that it may well be at least another year – perhaps two - before substantial Western investment can take place in the upstream sector. In the meantime, China and India in particular, together with Malaysia, are taking advantage of the situation to secure strategic crude oil supplies for their rapidly expanding economies. Although the first cargo of crude exported in 1999 went to a Shell refinery in Singapore, most exports are now believed to be destined for China and India.

6 The Petrodar consortium comprises, as for the GNOP consortium, China National Petroleum Corporation (41%), Malaysia’s Petronas (40%), and Sudapet (8%). Other members are two small Arabian Gulf companies, GOP and Al-Thani. Much of the construction of pipelines and facilities in this project is being undertaken by UAE-based Indian contractors, and Russian contractors.
3. **Industry Background** (cont’d)

3.3 **Pipelines and Ports**

(a) **Crude Oil Pipelines:**

*One Now, Four In Future*

The main 1540km *Greater Nile Petroleum Operating Company (GNPOC)* pipeline carrying the export crude oil from the main oilfields to Port Sudan passes via El Obeid and Khartoum. Up to 60,000 to 70,000 bpd of the crude oil is drawn off at these two places as refinery feedstock; the balance of the crude is exported through Port Bashir, 25 km south of Port Sudan as “Nile Blend”. This 24” pipeline is thought to be now carrying more than 300,000 bpd but may be further upgraded to cope with a maximum ceiling of 450,000 bpd.

A second crude oil pipeline connecting *Al Foula*, west the existing oilfields, is being constructed by CNPC to feed expanded capacity at the Khartoum refinery. This 730 km line is expected to open by the end of 2004 with a daily capacity of 12,000 bpd, rising to 40,000 bpd, with a maximum capacity of 100,000 bpd.

Two other crude oil pipelines are under construction, scheduled for completion in the second half of 2005. The first of these, a 32” pipe of some 1400 km in length and owned by *Petrodar*, runs roughly parallel to the existing GNPOC line from Adu, near Bentiu, to Port Sudan. The second, a 40” *White Nile Petroleum Company* line, takes a direct route to Port Sudan from oilfields in Blocks 3 and 7, near the Ethiopian border due east of Heglig and Unity, without passing through any of the refineries.

Clearly, these pipelines are being built on the knowledge that production can be brought onstream to utilise them as soon as they are operational. They will also favourably affect the economics of discoveries further south in that it will make them more viable. Operators of the new oilfields will not have to build their own pipelines and can “rent” space in these existing pipelines. However, it remains to be seen whether the SPLM/A will insist on oil developed in areas they control being exported by pipeline through Kenya, and not through the north.

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7 In addition to the main Heglig (Block 1) and Unity (Block 2) fields, Block 1 and 2 include the El Toor, Toma, Toma South, El Nar, Talih, Munga and Umm Sagura fields. The adjacent Block 4 includes the Kaikang, Timsa and Bamboo fields. Block 5A to the south and adjacent to Blocks 1 (Unity) and 4 (Kaikang) include the Thar Jath field.
3. Industry Background (cont’d)

3.4 Pipelines and Ports (cont’d)

(b) Refined Product Pipelines: One Now, Another Under Construction

At present, there is only one major refined product pipeline operational in Sudan. This is a 12” line from the Khartoum Refinery to Port Sudan, used to carry gasoline produced in excess of local needs for export. This line can, if necessary, carry other types of fuel. It was originally constructed in the 1970’s to carry imported fuel products from Port Sudan to Khartoum before Sudan started producing its own refined fuels. Technically, it would be possible to reverse it should it be necessary to transport fuels from Port Sudan to Khartoum.

A second 12” refined products pipeline is under construction by a subsidiary of India’s Oil and Natural Gas Corporation (which also holds interests in Sudan’s upstream sector) from the Khartoum Refinery to Port Sudan. The purpose of this is the carry export gasoline produced by additional processing capacity presently being built at the refinery. This line is expected to be commissioned by late 2005 to coincide with the completion of the refinery expansion programme.

There are no known major refined product pipelines in Sudan south of Khartoum.

(b) Port Bashair and Port Sudan: Export and Import

The Port Bashair crude export terminal has storage capacity for 3.2 million barrels of crude oil (about 12 days current exports). However, this storage cannot be used for refined fuel products.

Availability of storage at Port Sudan is generally good. Further storage for both crude oil and refined products is available at the non-operational Port Sudan refinery, plus a number of private company installations in the immediate vicinity of the port, all connected by pipeline.

Although cargo operations at Port Sudan are generally chaotic, fuel imports and exports seem to work quite efficiently. A detailed survey of the storage facilities and the capacity of the import facilities was not conducted, but Sudan imported virtually all its refined product requirements as recently as mid-2000, before the Khartoum Jaili refinery was commissioned. Significant import facilities are likely to be still operational; reports suggest that available storage may exceed several hundred million litres.

3.5 Refineries and Local Fuel Supply

Sudan has two major working refineries, the largest at Jaili about 30 kilometres north of Khartoum with a current processing capacity of about 50,000 barrels per day (bpd) being expanded to 90,000 to 100,000 bpd; and a smaller one at El Obeid, processing about 10,000 bpd. A third small and much older refinery, presently non-operational but being expanded from a capacity of about 25,000 bpd to 100,000 bpd and due to come back onstream by 2006, is located at Port Sudan.

Several other small private refineries exist in Sudan, including small units in the oilfields to provide diesel fuel for oil operations. These small plants were not considered for the purposes of this report as they do not provide aviation fuel, and their contribution to diesel supplies is relatively modest and already spoken for.

Sudan’s refining capacity is likely to increase by about 80% by the end of 2005 from a base of about 60,000 to 70,000 bpd in early 2004. By the end of 2006, it will be about three times the level it was at the beginning of 2004. Although welcome, this expansion will not be onstream in time to serve the needs of the UN family in the country.
3. **Industry Background** (cont’d)

3.4 **Refineries and Local Fuel Supply** (cont’d)

Until relatively recently, the two operational refineries generally provided sufficient refined products for Sudan’s regular needs. However, the installation for gas turbines for electrical power generation in Khartoum about two years ago has greatly increased requirements for diesel to a point where relatively modest imports are now required. Gasoline production is in excess of local requirements, with the surplus provided by the Khartoum Refinery exported from Port Sudan⁸.

The humanitarian crisis in the Darfur, with its heavy dependency on aviation given the vast distances and lack of roads in the region, has led to an increase in demand for Jet A1 fuel that outstrips the capacity of Sudan’s own refining industry. This has led to imports of aviation fuel through Port Sudan by oil companies, with the permission of the Government of Sudan.

**Khartoum Refinery:** Built by a joint venture between Sudan and China National Petroleum Company (CNPC), this refinery started operation in June 2000 and now has a processing capacity of at least **50,000 barrels of crude oil per day**. Crude is supplied via a pipeline from the major Heglig and Unity oil fields to the south. The refinery produces the full range of products including Jet A-1 aviation fuel.

The Government of Sudan has initiated a phased development programme to increase the capacity of the refinery. The first phase – believed to be on schedule – should increase processing capacity to **60,000 barrels per day** by September 2004. By late 2005, completion of the second phase is expected to raise production capacity to **90,000 barrels per day**.

A new Indian-sponsored 12-inch fuel products pipeline is being built from the refinery to Port Sudan to allow export of the additional gasoline produced by the additional production capacity. This is in addition to an existing fuel products pipeline from the refinery to Port Sudan, not running at full capacity.

**El Obeid Refinery:** This refinery is a distillery-type plant, commonly known as a “skimmer” with a processing capacity of around **10,000 barrels of crude oil per day**. The level of technology used in this type of refinery is relatively low. The main products are gasoline, diesel and fuel oil for local consumption, with no Jet A-1 aviation fuel produced. There are no known current plans to increase or expand this installation. In any event, any expansion would most likely be modest in the overall context of the country’s refining capacity.

**Port Sudan Refinery:** This refinery is presently closed for major rehabilitation and refurbishment with work carried out by CNPC in partnership with Sudan Petroleum Corporation. The upgrade programme is intended to increase exports of refined fuel products from Port Sudan. However, increasing domestic need for fuels, particularly Jet A-1 and diesel, may well dictate that at least some of these fuels are used internally. Consideration is being given to reversing the current pipeline used to export gasoline from Khartoum Refinery but this will not take place until the new Indian pipeline linking the Khartoum Refinery to the Port Sudan fuel export terminal is completed. This will not occur until at least 2006 so will be of no relevance to the current humanitarian situation. Processing capacity before the shutdown was reported at about 25,000 bpd of crude oil. Capacity on reopening is expected to be about 100,000 bpd.

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⁸ The oil refining process results in certain generally fixed percentages (depending on the technology used) of high-end fuels (i.e. diesel, aviation fuel, kerosene and gasoline) being produced from crude oil. These percentages can be varied, but only to a limited extent, and only then between certain types of fuels. For example, it is possible to increase kerosene or aviation fuel output for a given quantity of crude oil processed by reducing diesel production, and vice-versa, but not possible to increase diesel output by reducing the amount of gasoline produced. As such, although Sudan has a surplus of gasoline and a shortage of diesel for power generation, it is not possible to “replace” the gasoline production with diesel. Nor is it possible to use the gasoline in power generation turbines. The gasoline must therefore be sold abroad to pay for diesel imports.
4. Fuel Supply

4.1 Overview

The capacity of Sudan’s refining industry and thus the local supply of fuels is programmed to meet national requirements. This is based on market trends and has attracted a capital investment programme to match the country’s growth expectations. Overall growth in demand for fuels from Sudan’s own domestic economic growth, exclusive of any extra demand created by UN operations, is about 6%.

Economies of scale in the refining industry dictate that only very large refinery complexes (processing at least a million barrels of crude oil per day) are profitable. With these low margins, it is generally not economic for mid-level producers such as Sudan to refine much more than their own domestic needs. By doing so, they eliminate the cost of transport from abroad and provide their own security of supply.

National demand – and broadly national refinery production – for 2004 is estimated as follows. Gasoline production exceeds demand with the surplus exported, and diesel production does not quite meet demand, with the balance imported. Aviation fuel and heavy fuel oil production generally meet national requirements.

<table>
<thead>
<tr>
<th>Annual demand 2004 millions of litres</th>
<th>Benzene (Gasoline)</th>
<th>Diesel</th>
<th>Aviation Fuel</th>
<th>Fuel Oil</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retail Sector</td>
<td>494</td>
<td>722</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Industrial Sector</td>
<td>123</td>
<td>1,212</td>
<td>0</td>
<td>588</td>
</tr>
<tr>
<td>Aviation Sector</td>
<td>0</td>
<td>0</td>
<td>226</td>
<td>0</td>
</tr>
<tr>
<td>Total 3,452 mn litres</td>
<td>617</td>
<td>2,021</td>
<td>226</td>
<td>588</td>
</tr>
</tbody>
</table>

Source: Sudan Petroleum Co.

Notes
- Average monthly production figures obtained by dividing by 11 due to a one month refinery closure for major planned maintenance. Divide by 12 for monthly demand.
- For planning, overall growth 10%; retail 10%; industrial 10%; aviation 6%.

The bulk of the United Nation’s fuel needs are for aviation fuel which, in turn, account for a relatively small percentage of all local production. In other words, the greatest need for fuel arises from the product with the smallest local supply.

Aviation fuels requirements as a direct result of the humanitarian community’s response to the Darfurs crisis is now around 10 million litres per month (about 120 million litres per year), equivalent to approximately 50% of the national production. Most of this requirement arises from World Food Programme operations. The expected deployment of the DKPO mission in the South and African Union forces in the Darfurs will add a further Jet A-1 requirement of an average of 5 million litres and 300,000 litres per month respectively.

In addition to this, expanded humanitarian operations in the South may also increase demand, although much of this may be supplied through Kenya and Uganda with increased imports through Mombasa.

Thus, the additional demand for aviation fuels imposed by UN activities in Sudan to be supplied from the north amounts to at least 15.3 million litres per month, equivalent to 80% of national production. It is impracticable to expand local refining capacity to meet this in the short term, nor would it be economically advisable to do so, given that the high demand generated by the temporary UN presence is relatively short term vis a vis the several years required to recoup the investment required. If expansion did take place, Sudan would remain with significant and expensive unused refining capacity after UN operations wind down. It is therefore essential – and strongly recommended - that a carefully co-ordinated strategic fuel policy is implemented to ensure minimum disruption to the national economy and to avoid the UN creating an artificial but unsustainable market.
4. Fuel Supply (cont’d)

4.2 Supply of Aviation Fuels

(a) Commercial Suppliers

The supply of aviation fuels will always be problematic. A relatively small part of the supply will be from local sources at the Khartoum Jali Refinery; the balance will have to pass through a supply chain of up to several thousand kilometres from the point of importation at Port Sudan to the end users in the field, with certain areas in the south supplied from imports through Mombasa.

In Sudan, only three major petroleum companies - Shell, Petronas and Nile Petroleum - have significant storage and delivery potential either within their own operations or through their respective sub-contractors. Only Shell and Petronas have fuel import facilities; when other companies import, they hire those facilities, adding an additional cost. Imports through companies without their own import facilities should therefore be avoided.

The greatest user of aviation fuels at present is the World Food Programme (WFP). Shell Aviation of Sudan, in conjunction with the Sudan Petroleum Company, is currently carrying out importation on behalf of WFP with the following contracts in place for key locations:

<table>
<thead>
<tr>
<th>Location</th>
<th>Contractor</th>
<th>Relevance of Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Khartoum Airport</td>
<td>Shell Aviation</td>
<td>Main international airport</td>
</tr>
<tr>
<td>El Obeid (North Kordofan)</td>
<td>Shell Aviation, Matthew Transport Co.</td>
<td>Main base for food airdrops</td>
</tr>
<tr>
<td>El Fasher (Northern Darfur)</td>
<td>Matthew Transport Co.</td>
<td>Forward base in Darfurs</td>
</tr>
<tr>
<td>Nyala (Southern Darfur)</td>
<td>Matthew Transport Co.</td>
<td>Forward base in Darfurs</td>
</tr>
</tbody>
</table>

In any operation of this magnitude with such a long and tenuous supply line it would be, in the team’s opinion, both prudent and commercially sensible for WFP to engage a second contractor (on a short-term basis until a major integrated contract can be put in place) to ensure supply. In addition to being an excellent mechanism for controlling prices, this would help to stabilise some of the inadequacies in the existing arrangements and resolve supply chain problems. Considering the further requirement of the DPKO operations, any one company cannot, in our opinion, successfully deliver all aviation fuels requirements.

(b) Airport Authorities and Infrastructure

All airports in Sudan are the property of the Government of Sudan and run by the Civil Aviation Authority (CAA), a part of the Ministry of Aviation. All facilities on these airports are thus the responsibility of the CAA, which has a nationwide prioritised airport development programme.

As a general principle, airport infrastructure should be the responsibility of the host nation, particularly where the country has adequate resources to carry out such work. CAA representatives have expressed a willingness, if asked, to ensure that airport facilities are installed to meet the UN’s requirements and to expedite any current building programme with financial assistance from the UN when there is a clash in priorities. The Authority is conscious of the needs of the UN but is keen to avoid investing their scarce capital funds in unsustainable facilities which might be unutilised or underutilised after the UN’s departure. When facilities that are inconsistent with Sudan’s own long-term development priorities are required, the UN should bear at least part of the costs. In such cases, the UN would generally need to supply materials only with labour and equipment provided by the CAA. Furthermore, given the huge amounts of fuel involved in the UN mission, the contractor(s) appointed by the UN should install their own equipment to meet the fuel handling requirements, and not rely on the CAA to do so.

The current mission has and may give rise to requirements that go beyond Sudan’s sustainable development needs. The new airfield at Geneina in Western Darfur and the requirements at Kadugli for the missions in the south are clearly being implemented only to support the UN. In cases such as these, the UN should bear the additional costs.

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9 Petronas, Malaysia’s national oil company (www.petronas.com.my) entered the Sudanese downstream market by purchasing Mobil’s distribution network in 2003. Mobil is no longer present in Sudan.
4. Fuel Supply (cont’d)

4.3 Supply of Diesel

Supply of diesel poses less of a problem than aviation fuels. Although Sudan is not quite self-sufficient in diesel and must import (mainly because of the requirements of gas turbine power plants), the domestic shortfall is relatively modest. Furthermore, the UN’s needs for diesel are much less than for aviation fuel. Whereas the country’s second refinery, at El Obeid, produces no aviation fuel, it does provide diesel. Imported diesel is used in the east and north-east (from where most of Sudan’s agricultural demand emanates) to meet domestic demand, rather than in the south and west where the UN requires fuels. This frees up locally-produced diesel from Khartoum and El Obeid to supply UN operations with imports meeting domestic needs further east. It also limits transport costs. Diesel imports are well run by the Ministry of Energy and Mines and Sudanese Petroleum Corporation.

As an indication of the situation, WFP diesel consumption and that of its implementing partners is probably less than one million litres per month. Fuel used by WFP transportation contractors may amount to no more than two million litres per month. Thus, extra diesel demand because of UN operations is probably equivalent to no more than three million litres per month, or 2% of national production (see chart on page 9). This will, however, require monitoring as the number of assets deployed is growing monthly.

To ensure continuity of supply, WFP are placing a contract with one of the major local suppliers to establish a reserve stock of diesel in Darfur in the event that their contractors encounter fuel supply difficulties. The pricing structure we recommend for this contract is Platts\(^{10}\) + Variables + Fixed Costs.

4.4 Kerosene

Sudan also produces kerosene. This fuel will undoubtedly play an increasingly important role in the IDP camps and surrounding areas where wood is currently the main cooking fuel. It is also essential that some form of hydrocarbon heating is introduced at an early stage. The introduction of kerosene for cooking would also greatly assist the security of IDP’s as the current practice of women venturing into the bush at great personal risk to collect firewood would be reduced.

4.5 Liquid Petroleum Gas (LPG)

LPG, a propane/butane by-product of the oil refining process and direct product from oil production, as part of natural gas associated with crude oil when extracted, is used increasingly in North Sudan and Khartoum as a cooking fuel. Following a successful programme instituted by the Government to integrate LPG into the fuels market, coupled with the introduction of subsidised gas bottles, LPG is within the means of families in Khartoum and major cities in the North. It would, however, be difficult to extend this into the areas of the IDP camps. LPG, requiring specialised pressure vessels, is expensive to transport long distances and cannot be transported by air. Furthermore, a huge training programme would have to be undertaken in its safe use and suitable cookers provided. Less technically challenging fuels more suited to the needs of the areas served by the UN humanitarian community are more advisable in the short term.

However, in the longer term, with effective implementation, LPG can reduce the heavy use of charcoal and the consequent deforestation increasingly evident in rural areas. Sudan’s refineries do have the capacity to produce significantly more LPG than they are now. It was noted that they are flaring off quantities of surplus gas.

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\(^{10}\) Platts is an independent oil and fuels industry service that provides, amongst other things, authoritative benchmark world prices for all types of fuels at any point in time, allowing local prices to be calculated by adding other factors such as transportation peculiar to a particular location.
5. Fuel Dependencies

5.1 Overview

Sudan has been generally self-sufficient in fuels - with the slight exception of diesel – for its own domestic purposes since the Khartoum Refinery came onstream in 2000, following the commencement of major crude oil production the previous year, although shortages in aviation fuels have been experienced from time to time.

Khartoum’s Jali Refinery has been expanded in several planned phases to meet the needs of the growing economy. However, the refineries are unable to cope with impact of the Darfurs crisis and the UN intervention. WFP have had to import aviation fuels through their contractor, Shell. This will continue throughout the operation. Diesel appears to be in sufficient supply. Gasoline, although expensive, is in plentiful supply.

The agricultural sector is in desperate need of AFGAS for crop spraying. This product is not made in Sudan at present and is imported. As a result of these imports, together with diesel imports and WFP aviation fuel imports, combined with the effect of crude oil and gasoline exports, port congestion is becoming increasingly evident. Demurrage charges are being enforced, thereby increasing the cost.

5.2 Estimates of Dependencies

The following table outlines estimated monthly usage for current and expected operations by location for aviation fuels and diesel, with aviation fuels being clearly the most important. The main users of aviation fuel outside the commercial, agricultural and retail sector are WFP and DPKO air missions, with the JMC (Joint Military Commission), the African Union forces and the ICRC (International Committee of the Red Cross) being light users.

Requirements for the WFP, ICRC, broader humanitarian community (H.C., on the table below) and JMC are current. The timing of DPKO demand is uncertain at present but will peak between 30 and 120 days after final signing of the Peace Agreement. The JMC requirement will be absorbed into the DPKO mission as it progresses. Clearly, the needs of the humanitarian community (if diesel requirements for contractors are included) and DPKO are broadly similar.

<table>
<thead>
<tr>
<th>Thousands of Litres/ month</th>
<th>Jet A-1 Aviation Fuel</th>
<th>Diesel</th>
<th>Combined Both Fuels</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>WFP</td>
<td>DPKO</td>
<td>JMC</td>
</tr>
<tr>
<td>Khartoum</td>
<td>5,832</td>
<td>649</td>
<td>46</td>
</tr>
<tr>
<td>Port Sudan</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>El Obeid</td>
<td>2,689</td>
<td>700</td>
<td></td>
</tr>
<tr>
<td>WFP Contractors</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Darfurs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- El Fasher</td>
<td>432</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Nyala</td>
<td>519</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Geneina</td>
<td>432</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Central and East</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Kadugli</td>
<td>3,313</td>
<td>514</td>
<td></td>
</tr>
<tr>
<td>- Ed Damazin</td>
<td>241</td>
<td></td>
<td></td>
</tr>
<tr>
<td>South</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Malakal</td>
<td>882</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Juba</td>
<td>500(^1)</td>
<td>440</td>
<td></td>
</tr>
<tr>
<td>- Wau</td>
<td>10</td>
<td>550</td>
<td></td>
</tr>
<tr>
<td>- Rumbek</td>
<td>300</td>
<td>90</td>
<td></td>
</tr>
<tr>
<td>- Kapoeta</td>
<td>60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Raja</td>
<td>30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Abyei</td>
<td>60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>10,714</td>
<td>7,015</td>
<td>560</td>
</tr>
<tr>
<td>Combined Both Fuels</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\(^1\) This requirement for Juba will eventually increase to about 4 million litres per month once Operation Lifeline Sudan and WFP operations for South Sudan relocate from Lokichokio in northwest Kenya to Juba.
5. Fuel Dependencies (cont’d)

5.2 Estimates of Dependencies (cont’d)

| Distribution of Jet A-1 Requirements, Humanitarian & DPKO, All Sudan |

<table>
<thead>
<tr>
<th>City</th>
</tr>
</thead>
<tbody>
<tr>
<td>Khartoum</td>
</tr>
<tr>
<td>Nyala</td>
</tr>
<tr>
<td>El-Fasher</td>
</tr>
<tr>
<td>Kadugli</td>
</tr>
<tr>
<td>Ed Damazin</td>
</tr>
<tr>
<td>Malakal</td>
</tr>
<tr>
<td>Juba</td>
</tr>
<tr>
<td>Wau</td>
</tr>
<tr>
<td>Rumbek</td>
</tr>
<tr>
<td>Kapoeta</td>
</tr>
<tr>
<td>Abyei</td>
</tr>
<tr>
<td>Rajia</td>
</tr>
<tr>
<td>Abyei</td>
</tr>
</tbody>
</table>

The above figures do not include the fuel requirements for international flights delivering aid direct from abroad. However, these aircraft often carry sufficient fuel for the round trip, or to enable them to fly to a nearby airport outside Sudan where there are plentiful fuel supplies.

5.3 Demand Beyond Sudan for Sudan Operations

In addition to the above requirements, Entebbe in Kampala is estimated to require 1.881 million litres per month of Jet A-1 for DPKO operations. A requirement of 4 million litres per month of Jet A-1 presently used in Lokichokio, in northwest Kenya for Operation Lifeline Sudan (OLS) operations into mainly Southern Sudan is likely to shift to Rumbek and Juba with the re-basing of WFP and OLS aircraft there once the Peace Agreement is signed, and once it is possible to supply such quantities of fuel to those two towns, particularly Juba with its well-developed airport.

(a) Current Supply

Juba is presently supplied with fuel only by an annual river barge convoy or by air. This is neither cost-effective nor sustainable for the quantities that may be required. Jet A-1 in Juba costs around US$4 per gallon (slightly less than US$1 per litre). The fuel presently used in Lokichokio is supplied through Mombasa.

Road access to Juba from the south will need to be restored before any move of operations from Lokichokio to Juba can take place. The supply from Kenya will continue until such time as the route from the north is restored, giving access to cheaper fuels. This will take the load off the already difficult supply chain from Mombasa. Rumbek is presently supplied from the south by road and by air from Lokichokio but an increase in supply would have to be overland.

River Nile barge access to Juba would also assist but is hampered by political constraints in the short to medium term, and logistical constraints through the limited (but growing) capacity of the barge industry. Once road (whether from the north or south) and substantial barge transport is resumed to Juba, the cost of fuels delivered through these means will most likely lead to air supply being discontinued.
5. Fuel Dependencies (cont’d)

5.3 Demand Beyond Sudan for Sudan Operations (cont’d)

(b) Entebbe

We do not expect that the operations for Sudan presently flown out of Entebbe will move into Sudan. As with Lokichokio, fuel for Entebbe is imported through Mombasa and will continue to have to be supplied through there and moved across Kenya and Uganda to Entebbe.

5.4 Effect of Infrastructure Improvements in the Darfurs

For the WFP Jet A-1 figures for the Darfurs operation, improvement to the airfield apron at Nyala will allow WFP to station additional aircraft there in direct support of the mission. This should not change the overall total for the fuel requirement, but will cause some shift between locations. Similarly, the figures for the Joint Military Commission may shift between locations, but the overall figure will remain unchanged.

The ICRC aircraft dedicated to the Darfurs operation also refuels under a contract arrangement in Nyala, El Fasher and El Obeid but the amount of fuel involved is negligible compared to that used by other actors.

5.5 Diesel

It is more difficult to differentiate the quantities of diesel used by the humanitarian community from that used by the domestic Sudanese market. In order to try to identify demand and any supply problems from the humanitarian community, various actors were circulated with a good response rate.

It was found that there are no real problems with diesel supply and that an increasing number of retail stations and opening in all areas where the humanitarian community is working, in response to market demands. Discussions with the three major oil distribution companies in Sudan indicated that they are responding to the need created by the Darfurs crisis by increasing their storage capacity in and supply to the three Darfurs state capitals on El Fasher, Nyala and Geneina.

5.6 Other Oil and Fuels Needs

Gasoline (alternately known as benzene) is in ample supply. Surplus production from Sudan’s own refineries is being exported so some of this may be diverted for the relatively modest demand of the humanitarian community. Furthermore, both of Sudan’s major operational refineries produce gasoline, so it is readily available from El Obeid, south of Khartoum.

Oil and lubricants are readily available. It is not envisaged that there will be any shortages of these in the foreseeable future.

Kerosene for cooking and lighting, including the needs of the peacekeeping operation, has not been reviewed in this survey. The need is unlikely to be great and could be met by aviation fuel, which is essentially kerosene.

LPG for cooking, again mainly for the peacekeepers, has not been considered but it should be a relatively minor need, and gas cylinders filled in Khartoum or other major towns can be transported overland by truck.
6. Storage Countrywide

Sudan is a relatively well-developed in the fuel sector. The country is vast with an integrated air and land communication systems and national network of fuel storage depots, although there may be insufficient storage in the locations where it is most required by the UN. In the main, those depots that do exist service needs for diesel but may be converted to store aviation fuel. This is, however, a specialist task and should only be carried out by competent personnel and recertified by an Authorised Person (Petroleum).

The general availability of storage according to the major oil and fuels companies operating in Sudan is shown below. The figures are not definitive and are intended only to portray general orders of magnitude of storage available. Considerably more storage may exist with oil exploration companies, sugar cane processing plants, power generation plants and government bodies, including the military, but this would be unavailable for use by the UN. The storage indicated only covers that for aviation fuel, or diesel storage that could be converted with relative ease for aviation fuel usage. Crude oil and heavy fuel oil storage is expressly excluded as this may not be easily converted. All Joint Military Commission storage is presently for aviation fuel.

The UN’s Darfur mission has a long logistical pipeline stretching several thousand kilometres from Port Sudan to the extreme west of Sudan at Geneina. The key air hubs for this operation are Khartoum for the Humanitarian Air Services (HAS), El Obeid for food air drops, and Nyala for air cargo and mission support.

Khartoum appears to be working well. After initial shortages of Jet A-1, the system has geared itself to meet the demands of international and domestic air operators and HAS. Further west, El Obeid has two contractors, Matthew Petroleum and Shell. It is therefore well-served for both storage and distribution. However, Nyala is problematic. Flights have been stranded there through lack of fuels on a regular basis. The current contract has insufficient storage to meet current and future demands. We therefore recommend that a second contractor - either Petronas or Nile Bakri - are approached to provide an alternative service. This will ensure a more sustainable supply and help to control prices through competition. Shell cannot participate in this due to a marketing agreement with Matthew Petroleum not to compete with it or offer services in Nyala, El Fasher or Geneina.

We further recommend that prepaid stocks (being UN property) are held within easy reach of the Nyala airfield as an emergency reserve to ensure that any interruption to supply by road can be absorbed without detriment to the mission.

<table>
<thead>
<tr>
<th>In thousands of litres</th>
<th>Commercial Entities</th>
<th>JMC</th>
<th>Combined Total</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Khartoum Area</td>
<td>30,391</td>
<td>100</td>
<td>30,491</td>
<td>C</td>
</tr>
<tr>
<td>North (Red Sea) and North</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Port Sudan</td>
<td>49,335</td>
<td></td>
<td>49,335</td>
<td></td>
</tr>
<tr>
<td>Athbara</td>
<td>400</td>
<td></td>
<td>400</td>
<td></td>
</tr>
<tr>
<td>Shendi</td>
<td>400</td>
<td></td>
<td>400</td>
<td></td>
</tr>
<tr>
<td>Karima</td>
<td>700</td>
<td></td>
<td>700</td>
<td></td>
</tr>
<tr>
<td>Kordofans and White Nile</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>El Obeid, N. Kordofan</td>
<td>4,171</td>
<td>100</td>
<td>4,271</td>
<td>C</td>
</tr>
<tr>
<td>Kosti, Gezira</td>
<td>5,327</td>
<td></td>
<td>5,327</td>
<td>B</td>
</tr>
<tr>
<td>Kadugli, S. Kordofan</td>
<td>1,300</td>
<td>75</td>
<td>1,375</td>
<td>A</td>
</tr>
<tr>
<td>Tilo, S.Kordofan</td>
<td>90</td>
<td></td>
<td>90</td>
<td></td>
</tr>
<tr>
<td>Muglad, W. Kordofan</td>
<td>50</td>
<td></td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>Central, East of Nile</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sinnar</td>
<td>530</td>
<td></td>
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</tr>
<tr>
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<td>320</td>
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<td>Darfurs</td>
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<td>Malakal</td>
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<td></td>
</tr>
<tr>
<td>Juba</td>
<td>910</td>
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<td>910</td>
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</tr>
<tr>
<td>TOTAL</td>
<td>101,844</td>
<td>958</td>
<td>102,802</td>
<td></td>
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</table>

Notes. A: DPKO planned air operations location; B: DPKO planned logistics bases; C: DPKO, planned air operations and logistics base, combined. Yellow shading – proposed strategic storage locations; Green shading - main locations for Darfurs operation.

Other DPKO air operations locations not noted above may include Wau, Rumbek and Kapoeta in the south, Raja and Abyei, as well as Entebbe in Uganda. Other DPKO logistics bases not included above may include El Foula and Bentiu, as well as several smaller locations in the south.
7. Reducing Vulnerability: Buffer Stocks for Managing Risk

The core business of UN agencies and humanitarian NGO’s is the delivery of aid; the main activity of the DPKO is peacekeeping and monitoring operations. Neither has the organic expertise or experience to install, commission, run and decommission fuel installations, although they (particularly DPKO) can manage and oversee contracts for such operations. Both parts of the UN generally engage local or international transportation contractors to meet their transport needs, whether delivery of aid or of supplies for DPKO personnel. It is therefore reasonable to expect those transportation contractors to supply their own fuels. In most cases, this happens.

There are, however, circumstances when reliance on commercial contractors is not feasible owing to security or internal supply chain problems such as pipeline failures, unexpected disruptions in refinery operations, inclement weather, particularly in the rainy season, which makes roads impassable, or other unforeseen occurrences that may cause contractors to invoke *force majeure*. The UN must, at times, rely solely on its own supplies. As such, a well-planned storage strategy is essential to continuity of operations in missions as complex as those in Sudan. Adequate buffer stocks must be in place to deal with a significant disruption in supply, or an unexpected increase in demand. The size of these stocks will range from large holdings for organisations like the DPKO to a few 200 litre drums for the smaller NGO’s.

However, holding stocks is expensive. Not only must the fuel and the tankage for bigger stocks be financed but the facilities must be adequate for quality control, secure, staffed and managed. There is a trade-off between cost and availability.

We suggest that a system be used whereby key locations hold strategic stocks, and lesser stocks be held at operational locations. The strategic stock locations would be readily suppliable by large road tankers and linked to Khartoum by good all-weather roads.

(a) Strategic stocks

The amount of stocks to be held at the strategic locations, and the selection of those locations requires careful appraisal and an appreciation of where the demands for fuel will occur, and at what levels. Under normal circumstances, we would suggest that 30 days’ supply be held in areas located some distance from the refineries (for diesel) or point of import or major storage (Port Sudan and Khartoum) for aviation fuels. The contract that allows for this needs to specify who (usually a contractor) will be responsible for securing the supplies, operating the facility, dispensing the fuel, and accounting for it to the agencies.

(b) Field stocks

The minimum stock levels that should be held in the field, particularly at those sites supporting air operations, should be calculated according to the formula of (Daily resupply rate less daily usage rate) times seven. In other words, seven days supply should be held at all times in most places. Some field locations where access by road may be particularly difficult at certain times of the year owing to weather, or those locations with a particular security concern, should hold more. Some locations may be inaccessible for up to a month at a time.

We further recommend that plans be rehearsed to prevent abuse, corruption and non-compliance in the supply system, with graduated restrictions on usage when stocks in any locations fall below the mandated minimum levels. This could be based on a colour-coded system to indicate the level of restrictions. An outline for the basis of this planning is at Annex C.

The management of the strategic stocks at all levels requires careful and flexible management. Fuel has a limited useful life span and must be turned over regularly or it cannot be used. The strategic sites could be based on existing facilities in the country and the management of those stocks passed to contractors. This may be attractive to the UN as it transfers risk, but perhaps at an additional cost. In cases where the available facilities are not owned by the UN’s contractor, it may be advisable for the UN to contract direct with the owner of the facilities and to open them to its contractor. In the case of airfields, the contractor could be engaged to provide both the fuel and the facilities in a “turnkey” operation.
8. Distribution

8.1 Overview

Sudan’s transportation infrastructure is growing rapidly, in large measure driven by the expanding oil exploration and production industry. The lower fuel prices available in Sudan over the past four years since domestic oil production and refining commenced, compared to the 1990’s when all fuels had to be imported, and the import replacement, has given a great boost to the economy and increased the competitiveness of Sudanese agriculture, thus further expanding the demand for services from the transport sector.

However, Sudan’s transport fleet is still a very mixed combination of road, rail and river vehicles, generally poorly maintained and with chronic underinvestment. In the south of Sudan, owing mainly to the long conflict between the Government and the Sudan People Liberation Movement/Army, transport development in recent years is almost non-existent.

8.2 Road Transportation

Demand for road tankers necessary to transport WFP’s aviation fuels needs is already stretching the capacity of the haulage industry. To assist in this, the Ministry of Transport has waived axle weight limitations for the UN and its contractors. Furthermore, diesel and gasoline tankers are being converted for use with Jet A-1.

With WFP’s total requirements of about 11 million litres per month\(^\text{12}\), this requires approximately 300 tankers, each of 36,000 litres capacity. A single one-way journey from Port Sudan to Kosti takes around 6 days. Factoring in the return time, rest, breakdowns and maintenance, and the fact that much of the fuel needs to go much further than Kosti, to the Darfur, in smaller, more rugged, lesser-wheeled trucks capable to operating on the difficult roads in Western Sudan (Port Sudan to Geneina in Western Darfur can take 15 to 21 days), each truck can only be relied on to do one trip per month. Therefore, with the total monthly requirements for the UN family of in excess on 25 million litres of aviation fuel and diesel, it would take up to 90 days\(^\text{13}\) to build up a reserve of one month’s supply, whilst still supplying current operations.

Nevertheless, there are an increasing number of paved roads in Sudan and the majority of main cities in the north and centre are linked with good all-weather roads. The road infrastructure is growing with economic development particularly in those areas where oil exploration and production is being undertaken. These roads should support large and efficient road fuel tankers. Furthermore, the pipeline from the Heglig and Unity fields, via El Obeid to Khartoum and on to Port Sudan, appears to have good maintenance access roads that are themselves well maintained. A number of roads in Muglad, Abyle and Bentiu areas are all-weather and used by heavy transport in support of the oilfield exploration camps.\(^\text{14}\)

It is critical to both the humanitarian and peacekeeping missions for the Sudanese road transport industry to meet these requirements. The industry has responded well to the increased demand and new tankers are appearing onto the market. However, this is a mission-critical area and should be monitored closely through the Department of the Minister of Energy and Mines.

An updated list of the main transportation companies operating in Sudan is available at www.unjlc.org.

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\(^{12}\) See dependencies. WFP’s total Jet A-1 dependency is 9.904 million litres per month. Diesel, excluding that used by transport contractors, is about 981,000 litres, for a combined total of both fuels of about 10.885 million litres. With 36,000 litre tankers, this requires 302 cargos.

\(^{13}\) 25 million litres (being, as per the dependencies estimate, total monthly peak requirements for both the humanitarian and peacekeeping communities for aviation fuels and diesel), at 10.885 litres per month using 302 x 36,000 tankers, requires 2.3 months, being the equivalent of about seventy days. Tankers taking fuel forward to operational locations on bad roads have to be smaller with a longer round-trip. Whilst building up stocks, the tanker fleet also needs to maintain supplies for current operations. Thus, 90 days is a reasonable estimate for time required for a tanker fleet of 300 trucks to build up reserve stocks, spread across the locations where there are required, of 25 million litres.

\(^{14}\) It should be noted that we were unable to find reference to these generally good roads on any of the readily available current mapping of Sudan. Perhaps mapping of these roads could be undertaken as the mission grows.
8. Distribution (cont’d)

8.3 Rail Transport

Sudan’s rail network of approximately 6,000 kilometres stretches southwest from Port Sudan to Khartoum, then south to Kosti before turning west, and running north then west of the Nuba Mountains to Babanusa. From there it branches west to Nyala, the capital of Southern Darfur, and south to Wau, the capital of Western Bahr Al-Ghazal and one of the main towns in Southern Sudan. Between Port Sudan and Khartoum, a major spur extends south several hundred kilometres along the eastern edge of the country in the agricultural heartland through Kassala and then turns west to join the main line near Kosti. Between Kosti and Babanusa, a small spur services El Obeid, the capital of North Kordofan. There are also branch lines to major points on the Nile north of Khartoum and to Wadi Haifa on the Egyptian border. About 1,400 km of the network is for plantation use only, with very narrow 600 mm gauge track.

Sudan’s vast distances and topography, together with the nature of its industries, makes rail a particularly well-suited form of transport for the country. However, the network is narrow gauge and in generally poor condition. Much of it – with the exception of several short lines used to link oilfields and the El Obeid refinery to the main lines – was built between 1887 and 1930. It requires significant financial investment.

Nevertheless, the Port Sudan to Khartoum line operates a regular schedule, transporting mainly imported goods. This line is adequately maintained and functions satisfactorily. The line from Khartoum through to Nyala suffers more from a lack of maintenance and poor security but it does transport heavy fuel oils and diesel quite efficiently to maintain public services in Nyala. It may also have been used to transport crude oil from the oilfields to the El Obeid refinery from a small oilfield west of El Obeid, and before the pipeline from the Heglig and Unity fields was commissioned in 1999.

The rail link to Wau from Babanusa is not currently functional and will require major investment to bring it back into service. A recent joint survey carried out by UNMAS15, the UN’s DPKO, Sudan Railways Corporation (SRC) and other interested bodies highlighted that mine clearance work is required before major work can proceed. It is unclear whether all of the eastern line via Kassala is operational.

According to SRC, their 2001-2005 five-year plan calls for substantial investment with the goal of increasing annual tonnage carried from 2.5 million to 4.5 million, and the operating speed from 60 to 100km/hour. The programme is said to involve a total of US$261mn, including S$135mn for upgrading the main Port Sudan-Khartoum trunk line, US$40mn for re-railing the Khartoum to El Obeid line, US$53mn for rehabilitating the Rahad/Babanousa/Nyala line. A further US$53mn is to be devoted to rehabilitating rolling stock, including locomotives. SRC is said to own about 150 locomotives of all types, about 5,000 freight wagons, 1,000 tanker wagons and 50 passenger coaches. It is unclear how much of this investment has been carried out as the network and rolling stock observed is in generally poor condition.

There have been discussions with the Canadian Government and other interested parties concerning what we believe to be a possible donation of locomotives or rail rolling stock to encourage into rail development. This is a good but long-term aspiration as rail is an excellent and very cost-effective means of transporting fuels. However, we do not expect that it will be a viable option in the short to medium term.

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15 UN Mine Action Service
8. Distribution (cont’d)

8.4 River Transport

The 6,671 km River Nile system is the dominant geographical feature of Sudan. It comprises the White Nile (the main part of the Nile that enters Sudan from Uganda) and the Blue Nile (which enters Sudan from Ethiopia) which merge in Khartoum before flowing downstream to Egypt’s Aswan High Dam and beyond.

Much of Sudan’s hydroelectric power is generated on stretches of the river north of Khartoum, rendering it non-navigable. The longest navigable part of the Nile is the stretch from Kosti to Juba. Other parts of the Blue Nile are really only passable in the rainy season.

River transport has, in the past, been a very cost effective form of transport along Sudan’s north-south axis south of Khartoum. This is no longer the case, owing in the main to the long conflict experienced by the country, particularly in the south which was a primary destination for traffic from Khartoum. There seems to have been very little real investment in the river barge system over much of the past generation although the private sector now seems to be paying more attention to the industry.

River transport companies generally operate a number of barges propelled by what are known as “pushers”, or flat-bottomed tugs. Convoys are formed with a combination of pushers and barges with the mix dependent on the size of the convoy and its cargo. There are a few self-propelled barges but most of these are in need of repair or major refurbishment.

In recent years, Juba, generally regarded as the capital of the south and the major town held by the Government of Sudan, has been served by an annual convoy from Khartoum to supplement air delivery of most requirements. At the time of writing, this year’s convoy was enroute to Juba with, for the first time in many years, civilian barges. The convoy consists of 46 barges and 14 pushers. Ten of the barges are carrying various amounts of fuels totalling 300 metric tonnes each, or more than 3 million litres in total. In practical terms, this will cover the needs of the Juba power station for three to four months.

Surprisingly, the cost difference between air freighted fuel (flown in using large fuel-carrying aircraft) and barged fuel is not as large as might be expected. Air-delivered diesel costs 1,000 Sudanese pounds; barged diesel costs 850 Sudanese Dinars per gallon. The 17.6% price difference of air-delivered fuel over barged fuel is relatively low and insignificant mainly because of the infrequency of barged delivery and the industry’s failure to take advantage of the economies of scale available through efficient barge operations. One must therefore question the pricing mechanism or the validity of river transport.

The port facilities at Juba also need to be upgraded substantially before cost- efficient barged fuel transportation can resume.

8.5 Hoverbarges

Given the difficult but flat terrain of South Sudan, particularly in the Sudd wetlands and swamps where building roads is especially difficult (in some cases impossible), one option to deliver fuels may be by large specialised hover barges, similar in concept to hovercraft but using lower speed and far more robust. Such vehicles are being developed to support the oil exploration industry. Although expensive to operate, they could deliver loads of between 50 and 250 tonnes. Further information on this technology is available from [www.hovertrans.com](http://www.hovertrans.com).

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16 The Sudanese Dinar is the country’s new currency. Previously, Sudan used the Sudanese Pound. Ten Sudanese Pounds are equal to one Sudanese Dinar. Confusingly, the Sudanese Pound no longer exists physically, but people still refer to it in their financial dealings.
9. The Darfurs: A Special, Pressing Case

9.1 Background

Over one million persons are estimated to have been internally displaced in the Western Sudanese region of Greater Darfur as a result of the 19 month conflict there. Of these internally displaced persons (IDP’s), an estimated 225,493 are in Southern Darfur, 324,215 in Northern Darfur and 500,748 in Western Darfur. A further estimated 203,548 people, comprising the host community in the Darfurs, have also been affected, bringing the total number of conflict-affected persons to about 1,260,421. A further significant number of people, who are neither IDP’s nor part of the host community, have also been affected by the conflict. The number is this latter group is not known but has been estimated at more than two million.

Protection and security remain the main concerns of IDP’s. Despite the signing of a ceasefire agreement on 8th April 2004 between the rebel movements in the Darfurs (the Sudanese Liberation Army, SLA; and Justice and Equality Movement, JEM) and the Government of Sudan, the parties to the conflict continue to fight, and the Government’s proxy Janjaweed militias continue to attack and loot villages throughout the Darfurs.

The humanitarian agencies and NGOs delivering support to the afflicted populations have located their key bases at the three Darfurs state capitals of Geneina, Nyala, El Fasher, and at El Obeid, the capital of Northern Kordofan, the state immediately to the east of Northern Darfur. El Obeid has a major airport from where transport aircraft operate from to deliver aid as necessary. El Fasher also has a large airport but less availability of fuel. The seasons and weather play a significant role in the method used to deliver aid. In the rainy season, July to November, there is increased air delivery including air dropped food and support items. Helicopters, which have a particularly high fuel usage, are also playing an increasing role in the operation.

The African Union has deployed monitors to the region but these are in small numbers. There are no plans within DPKO’s current remit to provide security support to the Darfurs Region but it is expected that some type of force may well be deployed to enhance security. This will most likely be an African Union Force acceptable to both sides, with logistical and other specialised support from the developed world. Plans have been made to preposition fuel storage in a number of locations in the Darfurs to support this operation.

9.2 Cost of Fuel in The Darfurs

The cost of fuels in the Darfurs directly reflects the security situation and road conditions. Geneina, in the far west, clearly has the highest prices as fuel must be transported the greatest distance over the harshest and most insecure terrain. Prices in Nyala are generally the lowest of the three Darfurs capitals as it is more accessible by rail from El Obeid and Khartoum.

The chart (left) illustrates the price trends this year, with prices in Khartoum as the benchmark. Each rise and fall is generally driven by a weather or security issue.

Note: One Imperial Gallon = 4.546 litres. $1US = 260 Sudan Dinars.
9. **The Darfurs: A Special Case** (cont’d)

9.2 **Cost of Fuel in The Darfurs** (cont’d)

In theory, fuel prices are controlled by the Government. This price control seems to be effective in Government-controlled areas, aided by a very strong transporters union lobby with the Government for diesel in particular. However, outside the government-controlled areas, the SPLM/A, SLA, JEM and other rebel movements and factions are able to exert influence through force of arms. This instability affects supply, and hence the price of fuels in areas such as the Darfurs.

Furthermore, the rains have severely affected the road and track network in the Darfurs region and consequently the ability of the fuel contractors to supply the area, particularly Geneina.

9.3 **Distribution**

We have consulted with a number of the oil companies and all are most are planning to reopen filling stations in the Darfurs to service the increased demand. We also noted that prices for ground fuels in El Fasher were stabilising as the filling stations improved their service. Prices in Nyala should stabilise as road security improves and as the rail services becomes more effective. The new or reopened fuel stations should improve both the standard and availability of all fuels.

Geneina, however, remains an isolated outpost and will be the most problematic of all the major locations. It is difficult to reach by road and has no rail connections. Both weather and security problems pose huge obstacles to the contractors. We were, however, encouraged to see a number of 8x8 vehicles, suitable for cross-country work, being converted into tankers. These have an all-weather ability to traverse the difficult terrain and although they could not carry the same load as a large road tanker and are expensive to operate, they should help to relieve the persistent fuel shortages.

Storage is available at Geneina but much of it is in poor condition, although this may improve in the dry season. On the other hand, the deployment more rugged 6 x 6 vehicles to deliver aid to more remote destinations as the mission extends into the hinterland will increase the pressure on the supply.

We suggest that agencies ensure that their supporting contractors and implementing partners have fully considered their fuel needs. It would also be sensible to hold a fuels reserve. In small locations with a few vehicles, we recommend that a reserve of 40 gallon drums be held, with care taken to turn that fuel every six months. In larger locations where local facilities are unavailable we suggest that a self-service containerised system is used. These hold up to 27,000 litres with 22 to 23,000 litres of useable fuels. Such systems for ground fuels are available commercially and have the advantages of being secure, require little specialist site preparation and no specialised training, can monitor fuel issues, and can be moved as and when the situation requires. They are suitable for missions such as those in Darfur but do require heavy duty dust filters with additional ventilation, including slatted vents. Two versions are available: one powered by an internal generator that can also be used for lighting when not in use and the other a diesel-powered version.

More effective bulk distribution of fuels such as this would greatly add to the efficiency of the transportation infrastructure. At present, 200 litre drums are filled and sealed in Port Sudan, and then trucked several thousand kilometres to locations such as Geneina. This is inefficient as the drums add cost (with rising steel prices, a cost that can be equivalent to more than 25% of the value of the fuel in the drum) and weight with their steel, and the space between the drums on a truck is unusable. It is more expensive to transport a given amount of fuel in drums than in a bulk tanker, especially over long distances, and the cost of the drums themselves is seldom recoverable. Nevertheless, without an installation such as the one described above to ensure fuel quality (especially vital for aviation fuels), more efficient bulk transport in tanker trucks cannot be used.

Drums will never be eliminated entirely as they will always be the only option for remote locations requiring relatively modest supply, but every effort should be made to minimise their use and to capitalise on the economics of bulk fuel installations.
9. The Darfurs: A Special Case (cont’d)

9.4 Supply, Internal and External

Currently Matthew Petroleum (Sudan), joint venture partner of Shell Sudan, are supplying under contract to WFP Air Services at Nyala and El Fasher. It is hoped that this service will be extended to Geneina by the end of September 2004. This should alleviate the situation.

We also considered fuel from other sources from the countries neighbouring the Darfurs region.

For Chad, we conducted in-depth discussions with Daher L’hotellier18, the contractors for the French Armed Forces operating in Chad. They have fuel transportation aircraft in Chad and can start immediate air delivery of fuels to Geneina, if necessary, subject to overflight and landing clearance. They have also carried out a successful trial run during the rainy season to deliver fuels by road to Geniena. They believe that they could deliver sufficient quantities of Jet A-1 at the equivalent of and US$0.85 per litre. Fuel deliveries from Chad to Geneina are likely to be both sufficient in volume and cost effective.

For Libya, we contacted two companies who were willing to deliver fuel directly from Benghazi by road. However, they could only deliver 2 x 22,000 litre tanks every 12 days. It was not possible for them to deliver the quantities required cost-effectively. This option should not be considered at present.

The Central African Republic borders Southern Darfur. We do not believe that sufficient supplies would be available from this source, not would the necessary logistical infrastructure be in place.

Deliveries from Egypt are not thought to be practicable given Egypt’s own needs and the vast distances of the nearest major Egyptian fuel facility from the Darfurs region and the difficult terrain.

18 Daher L’hotellier, Orlytech, Batiment 528,1 Allee Maryse Bastie, F 91781 Wissoux Cedex, Paris, FRANCE
10. The Peace Keeping Mission

10.1 Overview and Effects

The Department of Peace Keeping Operations mission is programmed to commence operations in Sudan following the implementation of the comprehensive Peace Agreement between the Government of Sudan (GoS) and the Sudan Peoples Liberation Movement/Army (SLPM/A). The agreement covers only the south of Sudan and has no effect on the Darfurs region.

The peace support mission comprises monitors, support teams, medical units and a raft of infrastructure, air and land assets. It is large in its own right but when coupled with the humanitarian missions to the South (which are likely to increase in the wake of the implementation of the Peace Agreement as refugees and displaced people return to their homes and as agriculture and industry are rejuvenated), and the Darfurs mission, the combined fuel requirement amount to the equivalent of more than 50% of Sudan’s fuel outputs. Drawing these needs from local supplies would seriously affect the growth of Sudan and the welfare of its peoples.

10.2 Importation and Strategic Storage

Given that local supplies are inadequate, the additional fuel requirements for the UN family should be imported through Port Sudan on the Red Sea. Import facilities at Port Sudan are sufficient to handle an importation exercise on this scale. Prior to first oil exports in mid-1999, the vast bulk of Sudan’s fuel requirements were imported through Port Sudan, so the recent expertise to do so exists.

The distances from Port Sudan to the UN users are immense and challenging. We would therefore recommend that strategic stock holdings are created in the areas of El Obeid, Kosti and Kadugli.

Based on our research, although not yet verified through detailed site visits, we believe that there is sufficient storage capability in those areas to hold stocks equivalent to 30 days usage by the UN. A number of locations will require refurbishment to meet the standards of Jet A-1 storage. In the main, the cost of this should be borne by the contractor as it would be justified by the volume of sales to the UN, thus relieving the UN of the substantial cost of installing its own facilities. However, in areas such as Kadugli, where the base load without UN involvement would not justify the required level of commercial investment, there should a cost sharing between the UN and contractor.

El Obeid, Kosti and Kadugli are recommended as strategic locations as all three are served by all-weather roads that could accommodate a fleet of large fuel tankers with relative ease. Furthermore, Kosti is on the White Nile and may be served by barge from Khartoum, although this is unlikely in practice, with so few fuel barges functional. Both Kosti and El Obeid are served by rail. El Obeid also has the country’s second major refinery, which produces diesel but not Jet A-1. Diesel stocks could be drawn from the refinery and parts of the domestic market further north usually supplied by El Obeid’s production replaced by the UN imports; such a swap arrangement would reduce transport costs. All three locations are planned DPKO logistics bases, with El Obeid and Kadugli also planned DPKO air hubs. From these strategic stock locations, the fuel would be transferred by a smaller fleet of tankers to the UN users in the field.

In addition to El Obeid and Kadugli (and Khartoum) DPKO have a number of key airfield hubs. These hubs should each hold no less that seven days supply. It is within the capability of any of the major contractors in Sudan to construct or improve the facilities themselves, or to subcontract existing facilities.

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19 Commercial contractors can often justify construction of such facilities based on the fact that they can service customers other than the UN in the area (thus utilizing economies of scale that might be unavailable if the facility were sized to meet the UN’s requirements alone) and use the margin from those sales to help finance the capital cost of the facility. The key condition must be that service to other customers does not compromise supply to the UN. Furthermore, whereas UN-constructed and owned facilities would either have to be sold at a low price or abandoned upon the departure of the mission, the contractors’ view is often that the facilities can be used for ongoing business post-UN involvement. Installation of such facilities also helps contractors to build market share. The fuels business is low margin and maximising market share in growth areas and throughput is essential to the economic viability of suppliers.
10. The Peace Keeping Mission (cont’d)

10.2 Importation and Strategic Storage (cont’d)

PORT SUDAN
Import point, mainly for Jet A-1. Storage. Linked by road and rail to Khartoum

Transit time: 2.6 days

Kassal

Transit time: 4.9 days

KHARTOUM
Main storage & main refinery, producing all fuel types, Jet, Diesel

Transit times from Khartoum
- Kosti: 1.0 days
- El Obeid: 2.6 days
- Kadugli: 4.0 days

By truck, with limited barging to Kosti

Regional Strategic Storage

From strategic storage locations, trucks can take 1 to 2 weeks to the Darfurs capitals.

By truck

Road and air supply from Chad possibly by contractor to French forces. Viable

Road supply from Libya, probably not viable

By truck

Transit time:

12” pipeline from Port Sudan to Khartoum built in 1970’s previously used to import fuel products to Khartoum now used for gasoline exports.

Might be possible to reverse for import once second pipeline, now under construction, is commissioned in late 2005.

By truck

By air, later by truck

By air delivery

By truck or flown in

By truck

By air

By truck

By air delivery

By truck or flown in

By truck

By truck

Truck transit times:
- Kosti to Malakal: 2.6 days
- Malakal to Juba: 2.9 days
- Juba to Wau: 4.0 days

Truck transit times:
- Mombasa to Juba (via Nairobi and Lokichokio): 7.9 days
- Mombasa to Entebbe: 5.9 days
- Entebbe to Juba: 3.0 days

Road resupply of fuel from Kenya and Uganda. Already happening for Wau. Possible for Juba once road constructed/ repaired, demined. OLS and other operations now from Lokichokio in Kenya will move to Juba once fuel available.

Mombasa, Kenya
Source of all fuels used in Kenya, Uganda, most of South Sudan. Mainly imports for South Sudan
10. The Peace Keeping Mission (cont’d)

10.3 The Imperative of Effective Co-ordination

The DKPO mission and fuels is a major issue that will require a high degree of co-operation and management between the UN Family, larger NGO’s, Government Ministries and the private sector if it is to be handled successfully and cost-effectively. We therefore recommend that a Joint Fuels User Group (JFUG) is formed with at least the following membership:

- Chairman, nominee Minister of Energy and Mines;
- Deputy Chair or Co-Chair, nominee of the UN entity tasked with overall fuel management;
- Member, Civil Aviation Authority, as most UN fuels usage is for aviation fuels;
- Member, Ministry Aviation, again, as air forms a large part of UN operations;
- Member, Ministry of Transport;
- Member, WFP as the largest humanitarian user of fuels
- Member, Department of Peacekeeping Operations as the likely second-largest user of UN fuels;
- Member, UNJLC representing other humanitarian organisations
- Member, Fuel Contractor when appointed

Other specialist skills can be called upon as required or the membership expanded to meet requirements at the time.

The aims of the JFUG would be to:

- Agree the specific roles and responsibilities of each party in respect to all common activities in the supply of fuels to the UN mission;
- Identify an immediate action plan to satisfy the initial mobilization needs of the DPKO and to support the humanitarian operations in the Darfurs;
- Establish a comprehensive master plan that covers the importation, transportation, storage and delivery of fuels that will assist the success of the UN’s missions in Sudan. The master plan will be a dynamic, living document and will require continuous updating;
- Establish procedures to address delays in the process;
- Establish a single authoritative point of contact within each organization for the passage of information and resolution of conflicting interests;
- Review and report performance and achievements of Group to the respective constituent organisations and other relevant parties;
- Jointly review all projects, procurement, implementation and operations on a quarterly basis;
- Create a monthly report for distribution to all concerned parties.

We recommend that the structure of the JUG and an outline document forming the Group is agreed formally between the UN resident Humanitarian Coordinator and the Minister of Energy and Mines.
11. Integration: An Opportunity for Real Cost Effectiveness

11.1 Concept

There are a number of areas where significant cost savings can be made by the UN family if some form of real integration is achieved. With the economies of scale available in the fuels area, and the huge cost which it imposes on UN operations, it is imperative that the UN Family look at the issue holistically and not in a piecemeal fashion. This will ensure that the DPKO and the humanitarian mission do not damage the fragile but growing economy of Sudan, and that the Sudanese people benefit from the UN missions with a legacy of sustainable infrastructure. The above goals are only attainable, in our opinion, with a single, integrated fuel service common to all members of the UN Family in Sudan.

Fuel is one of the areas of Common Services within the UN that is relatively non-contentious and holds out the promised of enormous cost and service benefits. The concept of integration in this context refers to the UN’s DPKO and the humanitarian community working together under the strategic leadership of a Special Representative of the Secretary-General, with separate Deputies responsible for the respective Peace Support and Humanitarian Pillars. These principles are outlined and argued in the 2000 Brahimi Report20.

We therefore recommend that a single tender for fuel importation and distribution is let to meet both the strategic and user needs, and that this contract is managed by a specifically nominated UN entity tasked with this on behalf of the UN family. Establishment of this contract should be linked to the renewals of contracts presently held by the WFP and other agencies so to attract maximum cost-effectiveness and delivery benefit. Although it may well be prudent to split the contract among several suppliers, one lead contractor should be appointed, as a single point of contact, to co-ordinate the private sector contractors.

11.2 Recommendations and Practical Issues

This would be a very large fuel importation project, valued in excess of US$100 million per annum, perhaps running for several years. It will require UN staff dedicated to working closely with commercial contractors and the UN-contractor team working in unison with the Government of Sudan.

The key recommendations are highlighted below, together with the practical issues that would need to be addressed:

(a) Strategic Storage

As discussed above, we believe that there is sufficient storage available in the recommended strategic locations of El Obeid, Kosti and Kadugli to store 30 days requirements of aviation fuel and diesel. Some change of use (from diesel storage to aviation fuel storage), plus refurbishment and recertification will be necessary.

(b) Timing

This will be critical. We suggest that the contract be awarded no later than the first half of December 2004.

(c) Lead Contractor Necessary

Should more than one contractor be involved (for example, one for Jet A-1 and one for diesel, or one serving one particular geographic area and another serving a different area), then it will be necessary for one contractor to be clearly designated as the lead or primary contractor, as the sole focal point for all contractual matters. There must be a clear and unambiguous line of communication and responsibility for the contractor side.

20 www.un.org/peace/reports/peace_operations/
11. Integration: An Opportunity for Real Cost Effectiveness (cont’d)

11.2 Recommendations and Practical Issues (cont’d)

(d) Stocks

Ownership of the stocks is of great importance. Commercially, tying up working capital in large stocks of fuel presents a great risk and cost to any contractor. The private sector generally works on “just-in-time” delivery, minimising stocks and balancing this against the cost of running out of stocks. The risk for the UN is that the contractor will transfer the cost of holding such stocks into the price. Alternatives that may be considered are:

- UN-owned stocks, whereby the UN, not the contractor, would own the 30 days stock in the tanks. This ensure that the stock is secured and cannot be moved without UN sanction, say through being sold to other customers or appropriated by the Government in times of crisis. If this approach is taken, it is possible that handling charges by the contractor may be waived owing to the scale of the operation and the reduction in risk to the contractor.

- Shared UN-Contractor ownership of the stocks, 50/50. This approach will lessen the risk to the UN and helps to align the interests of the contractor with those of the UN. It may, however, add costs at it will attract a premium by the contractor for storage and handling.

(e) Monitoring

The strategic stock levels will require careful monitoring to ensure that they do not fall below the mandated levels (or indeed to monitor whether those levels need to be increased or may be reduced). A number of commercial software packages that could assist with this are available on the market. We recommend that a centralised control room be established, manned 24 hours a day with representatives from the contractor and the UN, with the authority to release stocks and solve issues. This provides the UN users with one single point of contact for addressing problems arising on the ground.

(f) Stock turnover

The strategic stocks will require constant turning over on a regular basis, otherwise the fuel will become unusable. Like food, fuel has a “use by” date. As experience has shown in past operations, this task is difficult, requiring constant dialogue between the contractor, transporters and the users.

(g) Accounting and Arrangements

A mutually agreed and transparent system of accounting must be in place before the fuel contract is let. We suggest that the DPKO leads this as they have a dedicated fuel team staffed by personnel experienced in fuel handling and distribution. A series of Memoranda of Understanding between the DPKO and other participating members of the UN family will be necessary to establish how payment will be made, and how the respective members’ share of the strategic stocks will be financed.

(h) Contingency Planning

No operation is entirely predictable. There will be fluctuations in demand and supply. The operational tempo may increase suddenly or fall back unexpectedly. A surge in fuel demand may occur, or a situation may occur where the strategic tanks are full with no issues downstream in prospect and a delivery convoy on the way. It would therefore be wise if the fuel cell running the operation draws up a number of contingency plans for various scenarios, covering such events as a general strike with no fuel getting through from Port Sudan, a major refinery accident or extended maintenance that puts one or more of the refineries offline, or sabotage to the crude oil pipeline that causes disruption of crude oil to the refineries. This planning should mandate pre-determined conservancy measures, colour-coded for level of severity, and actions necessary to counter the problem. These plans will aid in identifying cases where the UN, at its cost, may assist the contractor. It also more clearly defines when the contractor may and may not invoke force majeure for non-performance. The scenarios should be rehearsed and the contractor fully involved in this.
11. Integration: An Opportunity for Real Cost Effectiveness (cont’d)

11.2 Recommendations and Practical Issues (cont’d)

(i) Importation

It is imperative that the important of fuels, particularly the aviation fuels, be handled by the Ministry of Energy and Mines Special Operations Group and the contractor directly, with no involvement from other organisations such as the Civil Aviation Administration or the Sudanese Petroleum Corporation. Involvement of these other parties would simply add cost and cause delay, and reduce or eliminate the direct benefit arising from the scale of the importation contract.

11.3 The Special Case of the South: Rumbek and Juba

Juba, Sudan’s most southern major settlement and the largest population centre held by the Government of Sudan in a region largely controlled by the SPLM/A, requires particular attention. The town may well develop into a major interface between the Government and the SPLM/A and also has an excellent international standard airport, capable of accommodating the largest aircraft. It will require delicate handling to ensure that safety standards are maintained.

We understand that there is an intention to shift the Operation Lifeline Sudan and the World Food Programme air support operations for South Sudan from the existing Lokichokio base in north-west Kenya to Rumbek and Juba. Clearly, this will depend on how soon normal facilities suitable for supporting this operation, including adequate fuel supplies, can be established at both locations, particularly Juba. Leaving aside security considerations, to supply fuels from Kenya to Juba will require road-building and mine clearance, and will stretch an already tenuous logistics chain that runs from Mombasa along what is at times a very difficult road. Resupply from Uganda (which is also supplied through Mombasa) would be just as difficult. We do not see that it will be practicable to supply Juba overland from either neighbouring country to the south before mid-2005, at the earliest.

It is presently the intention of DPKO to supply its operations in Juba with fuel delivered by aerial tanker, as the Government of Sudan itself does. This is very expensive, but reliable, and we see no alternative to this in the short term until other modes of transport are opened up. The air supply may well be supplemented by river transport once work has been completed on the river port and landing areas but we do not expect that barges will have the capacity to take over the main supply for fuels in the short to medium term. In time, however, oil exploration activities in TotalFinaElf’s block north of Juba will inevitably lead to roads being built from the north, allowing supply by road tanker. It is also quite likely that once oil production comes onstream from the area – at least two years hence – that a skimmer unit could be installed locally to aid local supply, particularly for diesel.

In the medium term, however, fuel supply for UN humanitarian operations in Juba may come from the south, by road, once the security situation allows. The fuel transported will be the same fuel that is presently imported through Mombasa for Lokichokio (although it will have to be transported further) so there should be no extra burden on the Sudanese fuel supply system. In order to allow this to happen, it is essential that priority be given to opening road routes to Juba from the south as soon as possible through demining and restoration of security.

We suggest that in order to encourage contractors and transporters to deliver fuel by road to Juba, a fixed-price, fixed-period, short-term contract is offered for delivery of fuels by road, perhaps from the south (Kenya or Uganda) first. This would accelerate the sense of urgency to get fuels into Juba by road, demonstrate that it is possible, encourage investment to facilitate regular road delivery of fuels into Juba, and encourage the regeneration process. The fixed price would have to be lower than that for air-delivered fuel to ensure that there is a market for the fuel in Juba.

Rumbek is presently supplied by road from Uganda (with fuel from Kenya) but the absence of bulk fuel installations (a situation that could change quickly) in the area and the huge distances that the fuel has to cover from the import point at Mombasa are a distinct disadvantage of this strategic location.

During the course of preparing this survey, it became apparent that a considerable sum in aviation fuels could be saved by using more fuel efficient aircraft, both helicopters and fixed-wing types. We also understand that the availability of suitable aircraft is an important factor and that mission capability is the prime consideration.

The aircraft engaged on a mission have to be able to do the job, and those aircraft that may be available are not always ideal. Furthermore, the introduction by the Government of Sudan of an upper limit of 20 years for the life of an airframe operating in Sudan has complicated the task of air planners on the mission.

However, it is clear that perhaps the time is ripe, with rising fuel costs, to look holistically at the mission costs rather than the cost of hiring the aircraft alone. The following very rudimentary analysis may provide an indication of the relative economics.

<table>
<thead>
<tr>
<th>Aircraft type</th>
<th>Litres per hour</th>
<th>Flying hrs per month</th>
<th>Fuel Costs per litre in US$</th>
<th>Fuel Cost per month</th>
<th>Flight cost per month</th>
<th>Monthly crew costs</th>
<th>Total monthly costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Helicopters</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MI8</td>
<td>700</td>
<td>80</td>
<td>0.50</td>
<td>28,000</td>
<td>148,200</td>
<td>25,775</td>
<td>201,975</td>
</tr>
<tr>
<td>Super Puma</td>
<td>628</td>
<td>80</td>
<td>0.50</td>
<td>25,120</td>
<td>145,200</td>
<td>26,800</td>
<td>197,120</td>
</tr>
<tr>
<td>Fixed-wing aircraft</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AN12</td>
<td>700</td>
<td>80</td>
<td>0.50</td>
<td>28,000</td>
<td>200,000</td>
<td>28,200</td>
<td>251,200</td>
</tr>
<tr>
<td>C 130</td>
<td>520</td>
<td>80</td>
<td>0.50</td>
<td>20,800</td>
<td>435,000</td>
<td>57,600</td>
<td>513,400</td>
</tr>
<tr>
<td>IL 76</td>
<td>8,910</td>
<td>80</td>
<td>0.50</td>
<td>356,400</td>
<td>135,197</td>
<td>28,200</td>
<td>519,797</td>
</tr>
</tbody>
</table>

NB The fuel price was selected at 0.50 cents across the board but this figure is likely to increase the further the machine operates from a main base. As such, the cost difference becomes greater, making more fuel efficient aircraft even more cost-effective. Also, with rising oil prices, the cost of Jet A-1 aviation is likely to continue increasing.

The above table only outlines cost, not all the other relevant factors. For example, the Super Puma helicopter travels considerably faster than an MI8 for the same fuel usage, covering more distance and thus being able to carry out more work per hour.

We estimate, roughly, that by applying the above figures to the current operation, aviation fuel usage could be reduce the fuel usage by 18%. This would reduce consumption monthly by around 2 million litres (about US$1 million). The economics will have to be worked through more thoroughly, taking into account all factors, to prove the case. For example, the more fuel-efficient Western transport aircraft are invariably less available. However, this should be pursued, if only to prove that the most effective options are being utilised.

13. The Threat of Sanctions: Serious But Unlikely

It is not the place of this survey to take a position on the appropriateness or otherwise of sanctions on Sudan’s oil industry, but the logistical effects on any such sanctions, should they occur, must be considered.

Should there be a ban on Sudan exporting its oil or oil products, it is technically possible for crude oil production to be “shut in”, that is, oilfield production reduced to a level barely sufficient to feed the refineries, and the oil kept in the ground. The sanctions would probably not prevent the country from continuing to refine oil for its own domestic needs. The fuels produced in this manner would still, however, be insufficient to meet Sudan’s domestic requirements and those of the UN. Imports would still be necessary. If the sanctions prevented imports, or if Sudan’s reaction to the sanctions stopped such imports, then the UN missions in Sudan would founder.

We do not expect that the availability of LPG for cooking would be seriously affected by a reduction of crude oil production to a level sufficient to maintain feedstock to the refineries. Most LPG seems to be produced at the refineries and not extracted from crude oil in the fields.
13. The Threat of Sanctions: Serious But Unlikely (cont’d)

One relatively minor consequence of export sanctions would be that the refined products pipeline from Khartoum to Port Sudan would probably be unutilised and available for transporting fuel imports for the UN from Port Sudan to Khartoum. This would improve the logistical efficiency of fuel imports for the UN.

A greater consequence of the sanctions would be the cutting off of Government revenues needed for infrastructure improvements in areas where the UN is operating. In early 2004, oil exports are reported to account for about 43% of all Government revenue. With increasing production since then, that percentage is probably low. Under sanctions, it must be anticipated that the improvements to airports presently taking place, the nascent investment in the transportation industry, including rail, trucks and Nile barges, and vital road building, all of which are important to the logistical support on the UN’s missions, will cease. The effect on oil export sanctions on the economy will be severe, with most businesses taking a much more conservative and cautious view on investments. It will be much more difficult for the UN to find contractors or suppliers willing to invest in fuel facilities in remote locations; transport companies will not import much-need road fuel tankers.

The sanctions may also cut off revenues needed to finance the current expansion programmes at Khartoum’s Jaili Refinery and the Port Sudan Refinery. The country’s refining capacity will not increase as expected and will be even less capable of meeting at least part of the UN’s needs from domestic sources.

Given that permanent members of the UN Security Council have extensive interests in the Sudanese oil industry, and the emerging importance of Sudanese crude oil to the economy of key parts of the developing world, the possibility of sanctions being approved is not a foregone conclusion.
14. Summary of Recommendations

That:

- All fuels requirements for the UN missions in Sudan, with the minor exception of gasoline, kerosene and LPG, be imported, using a contractor/supplier with their own import facilities at Port Sudan. This affects aviation fuel and diesel in particular;

- A large, integrated contract, comprehensively addressing the fuels needs of all UN agencies operating in Sudan, both humanitarian and peace support, be entered into with a single prime contractor. Existing contracts for fuel supply, particularly those held by the World Food Programme, should be “folded” into this new master contract. The contractor would have to manage the imports in conjunction with the Sudanese Government;

- That the contract require the contractor to provide adequate storage facilities at key locations so that the UN does not have to bear the large capital outlay of building temporary facilities;

- That such contract is entered into by December 2004 and managed on behalf of the UN family by a specifically tasked UN entity;

- That a Joint Fuel Users’ Group be established, drawing together representatives from the Sudanese Government, the humanitarian community, the peacekeeping missions and the fuel supply contractor;

- Once the master contract is established, strategic stocks amounting to about 30 days fuel usage by the UN operations be established by the prime contractor at the key locations of El Obeid, Kosti and Kadugli. Concurrent with this, reserve stocks of at least seven days supply (more in areas where resupply may be difficult, especially in the rainy season) should be established at operational locations in the field. All these strategic and reserve stocks – but particularly the strategic stocks – should be the property of the UN;

- Concurrent with the establishment of the master contract, a 24-hour fuel operations be set up with UN and contractor personnel and the authority to decide on fuel movements;

- The transport industry in Sudan be made aware of the UN’s transport requirements for fuels so that they may in turn invest in the necessary carrying capacity;

- In the near term, prior to the establishment of a master contract for all UN agencies, WFP enter into a contract with a second fuel supplier for Nyala and El Fasher;

- Construction of roads in the south from Kenya and Uganda to key towns and cities be expedited to as to allow ready delivery of fuels from those countries to the south;

- Where possible, and where the economics and fuel throughput allows, drummed fuel operations be replaced with more efficient and more cost-effective bulk fuel installations;

- The fuels contractor to the French Armed Forces in Chad be approached with a view to providing fuels to Geneina in Western Darfur, and that these arrangements be integrated with the master fuel supply contract;

- Relationships with Sudan’s Civil Aviation Authority be built and nurtured throughout the area of operations. This will be of great assistance in ensuring that priority is give to the infrastructure facilities at airports, particularly remote airports, required by the UN;

- Consideration be given by the UN to contributing financially to the capital improvements to airport facilities where these facilities are required principally for the UN mission and do not qualify as sustainable items of infrastructure that will be utilised by the local economy after the departure of the UN missions;
14. Summary of Recommendations (cont’d)

- The Sudanese Government be made aware of the desire of the UN to utilise the existing gasoline export pipeline from Khartoum to Port Sudan as an import pipeline as soon as the new gasoline export pipeline from Khartoum to Port Sudan is operational;

- Development and improvement of river ports and handling facilities, especially in the south, be encouraged so as to increase the cost-efficiency of Nile River barge transportation and thus reduce the cost of fuel delivered through this means;

- The use of locally-produced kerosene as a heating, lighting and cooking fuel be encouraged in the IDP camps;

- In the long term, the development of LPG as a cooking fuel outside the cities of Northern Sudan be actively encouraged so as to reduce reliance on wood and charcoal, with attendant benefits for the safety and security of women and the environment.
Fuels in the Field: Storage Options

The storage options available for the humanitarian community and peacekeeping operations in the field are numerous but the main options are as follows:

- **Fabric Tanks.** Commonly known as “bladders”, these have a number of advantages. They are cheaper than steel tanks and easier to transport as they are lighter with less bulk. These tanks are easy to install and commission and can be moved if necessary. They do, however, require a relatively high degree of training to run and maintain in conditions found in Sudan. It is generally advisable to build bunds around the installations but adequate water drainage is necessary in areas with heavy rainfall.

- **Containerised installations** or semi-permanent installations have a number of advantages over temporary fabric tanks. They are more secure and can be used safely with minimal training as they have built-in density sensitive meters that preclude the transfer of the wrong fuel type down a line to an aircraft or helicopter. These installations are relatively easy to transport and can be commissioned with minimal site preparation.

- **Permanent installations.** These offer an excellent solution for many situations in Sudan as they provide permanent development for the area, with consequent economic benefits. There are a number of designs within two main styles, being upright vertical welded large capacity tanks and smaller above ground horizontal tanks. The downside of the larger, vertical variety are that they require extensive ground preparation and are generally only suitable for larger airfields. The smaller variety, of about 150,000 litres capacity, are more suited for smaller airfields but require concrete saddles. Both varieties require semi-skilled installation but a number of companies in Sudan can do this. A list of such companies is shown below.
Sudan Major Oil Infrastructure: Upstream and Refining

Port Sudan/Port Bashair: Export terminal for crude oil (carried by pipeline (purple) from oilfields, and for gasoline surplus to domestic needs, carried by pipeline (green) from Khartoum. Refinery at Port Sudan, the country’s first, closed for upgrading from 25,000 bpd to 100,000. Will not reopen before 2006.

Country’s main refinery at Jiali, Khartoum, Chinese-built, commissioned mid-2000, processes about 50,000 to 60,000 bpd of crude oil. Produces diesel, gasoline, fuel oil, Jet A-1 aviation fuel and...


Main oilfields, Heglig and Unity in Blocks 1 and 2. Other oilfields to west, east and south rapidly coming onstream. Production from Blocks 1 and 2 expected to peak in 2005 at 250,000 bpd, then gradually decline.
Annex C

Dealing With Vulnerability: A Guide to Crisis Conservation

**Aim:** To outline a draft procedure that may be implemented should fuel stocks in Sudan available to the UN Family and its implementing partners be disrupted.

**Suggested Measures**

<table>
<thead>
<tr>
<th>Alert Level</th>
<th>Indicators</th>
<th>Action to the taken</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green</td>
<td>Normal consumption, normal resupply foreseen.</td>
<td>No special measures in place. Monitor situation. Avoid complacency.</td>
</tr>
<tr>
<td>Yellow</td>
<td>21 days supply held in strategic reserve locations and resupply not envisaged within the next ten days.</td>
<td>Restrictions such as vehicle sharing, bus runs between key locations, restricted heavy fuel-using vehicles plant, restrict none essential journeys and begin preparations for higher alerts.</td>
</tr>
<tr>
<td>Orange</td>
<td>14 days operating stocks in strategic reserve with no resupply expect for no more than seven days.</td>
<td>As per yellow alert status but plan to reduce consumption by 50% for each location. Revisit plans for security of fuels as it will become a more attractive target. Appoint a fuel monitor per site with powers to implement change.</td>
</tr>
<tr>
<td>Red</td>
<td>Seven days operating stocks in strategic reserves with no resupply within 7 days.</td>
<td>Priority use of fuel only. i.e. medical, communications centres, emergency vehicles, security vehicles and lighting given priority.</td>
</tr>
</tbody>
</table>

We suggest that a contingency plan is drawn up for each location as part of a general security and evacuation plan. Each location should appoint a monitor or person responsible for monitoring and drawing up detailed plans in line with the above alert states to ensure that the plan is practicable and feasible. These plans should be practiced at least once every three months to ensure all are aware of what part they play.