

添付資料

- 資料1 面 談 記 録
- 資料2 収 集 資 料 リ ス ト
- 資料3 M W R 提 供 井 戸 デ ー タ
- 資料4 O M C O ラ ボ 保 有 機 材
- 資料5 現 地 再 委 託 用 参 考 資 料

面談記録

1. 商工省 (MCI) 鉱物局

- (1) 日時： 平成 11 年 10 月 23 日、10:00～10:30
- (2) 面談相手： Mohammad H. Qassim Al Yafei 局長、Saif Ali Al.Rashdi、鉱物事業開発部長(DIR)
- (3) 面談者： SW 調査団 (佐野団長、児玉課長代理(MMAJ)、早川調査課員(JICA)、大木、小林(以上 MINDECO))
- (4) 面談概要：
- ・調査団の訪問目的、団員紹介、調査日程、SW 概要説明 (団長)。
 - ・Qassim 局長から 2 つの注文が出された。
 - ① 現状 20,000t/d 規模の製錬所を 40,000t/d に拡張する計画に関し、環境調査 (SO₂) する事について、拡張規模を 100,000t/d した場合の検討。
 - ② 堆積場に蓋をする計画の実施に関する検討。この事業計画はすでに、テンドーが行われ、閣議にかけられる状態の由。
 - ・団としては、調査・検討の上回答する旨伝えた。

2. 地方自治環境省(MRME)

- (1) 日時： 平成 11 年 10 月 23 日、10:45～12:45
- (2) 面談相手： Ahmed Al Sabahi 環境局長、Mohammad A. Al Muharrami 副局長 (Deputy Director General)、Paul Sharples 公害防止監査長
- (3) 面談者： SW 調査団
- (4) 面談概要：
- ・調査団の訪問目的、団員紹介、SW 概要説明 (団長)。
 - ・調査の目的に関して、MRME は、汚染は古いもの (「過去に起こったのもので進行中ではない」の意) なので “pollution protection” や “prevention” ではなく “mitigation” あるいは “remediation” とした方がよい (MRME)。
 - ・SW 案の II. OBJECTIVE OF THE STUDY では “recommendations for improving”、 “countermeasures for mitigating” となっている (団)。
 - ・SW 案の若干の wording の変更に関する討議。
 - たとえば、
 - ・IV. SCOPE OF THE SUTDY 1. (5) “hydrological and geological study” を “hydrological, geological study and review of the monitoring data” とする。
 - ・(9) “capping method for the tailing dam” に関しては、すでに tender が行われ計画が進行中なので、“Design” を “Review and improve” とする。
 - ・(10) “Establishment of” を “Review and comment of the existing” とする。
 - ・(11) “Construction” を “Further development” とする。

- ・ dam capping に関する tender が実施されたことに関する団の質問に対し、capping は第1フェーズで、① dam capping、② Intersection、③ Diversion からなること、第2フェーズは ① resource contamination、②ploom に関する処置からなることを説明 (MRME)。
- ・ (4) に示す contamination source に関しては、1983、84年頃からの豊富なデータがあり、提供できる (MRME)。
- ・ questionnaire に関し、SW 調査と本格調査の違いを再度説明の上、今回は詳細データの提供より、データの有無と対応できる機関名の提示を依頼した (団)。

3. 商工省 (MCI) 鉱物局

- (1) 日時： 平成 11 年 10 月 23 日、13:15～14:45
- (2) 面談相手： Mohammad H. Qassim Al Yafei 局長、Saif Ali Al.Rashdi、鉱物事業開発部長(DIR)、Mohammad Javed Mirza 鉱山技師
- (3) 面談者： SW 調査団
- (4) 面談概要：
 - ・ Qassim 局長は、団の専門家に対し、製錬所 10 万 t/d への拡張計画に関する F/S の実施、及び堆積場の capping の妥当性検討に関し私見の提示を希望 (dam capping の OMCO tender document を提供)。
 - ・ 検討の上後日回答すると返答 (団)。

4. 水資源省 (MWR)

- (1) 日時： 平成 11 年 10 月 24 日、10:00～11:15
- (2) 面談相手： Suleiman Al.Akhzami 水資源保護局長、Juma Al Ralosh 課長、Mohd Isam Eldin 水理専門家 (以上 MWR)、Durair Al.Shaikh 管理部長 (MCI)
- (3) 面談者： SW 調査団
- (4) 面談概要：
 - ・ 調査団の訪問目的、団員紹介、SW 概要説明 (団長)。
 - ・ SW の調査目的に関し確認の上、ほぼ SW に記載されている調査内容は MWR で実施済みとコメント (MWR)
 - ・ 目的について再説明の上 MWR の理解を求め了解される (団長 VS MWR)。
 - ・ ボーリング調査位置、分析可能成分 (HCO_3^-)、堆積場カバーについて確認 (団)。
 - ・ Wadi Suq 沿いのボーリングは必要な個所はモニタリング井を含め実施、むしろ Baida、Aarja、Laseil、Laseil West 鉱山跡下流にモニタリング井が必要、 HCO_3^- も MWR の Labo で可能、堆積場カバーは 3 年前に MWR から提案したとコメント (MWR)。
 - ・ '96 の報告書のワジ及びフィッシャー入り地図、調査井戸位置図のコピーを依頼し、

明日、SoharにてOMCOから受領することとなった(MWR)。

5. 日本大使館

- (1) 日時： 平成11年10月24日、11:30～12:00
- (2) 面談相手： 神長大使
- (3) 面談者： SW調査団
- (4) 面談概要：
 - ・調査団の訪問目的、団員紹介、SW概要説明(団長)。
 - ・工業開調案件の見込みに関し質問あり(大使)。
 - ・同一国、同一時期の実施は難しいため可能性小と説明(団)。
 - ・MCIとMRME及びMWRとの関係について説明(Dam Capping及び各省所有の資料の多寡にからめ)(団長)。
 - ・ラカー金山鉱害防止案件について質問あり(大使)。
 - ・G/Gに含めて来年度実施される予定ありと聞くと説明(団)。
 - ・本格調査における支援をお願いして辞去(団長、団)。

6. ラルブクシュ農業・ボーリング会社(LALBUKSH IRRIGATION & DRILLING CO. L. L. C.)

- (1) 日時： 平成11年10月25日、10:00～11:50
- (2) 面談相手： H.P. Mishra ボーリング部長
- (3) 面談者： SW調査団
- (4) 面談概要：
 - ・L社業務内容説明(Mishra)
 - ・オールコアボーリング、モニタリング井掘削技術について打診(団)。
 - ・掘削の形、径、深度別見積もり依頼(団)、(29日にMCI経由で受領予定)。
 - ・工場視察、所有資機材調査

7. オマーン鉱山会社(OMCO) Sohar

- (1) 日時： 平成11年10月26日、9:30～13:40
- (2) 面談相手： Ali Said Abdullah Al-Waily 副所長、Barry Hepworth 分析部長、Najeeb Al-Sabahi 環境担当技師
- (3) 面談者： SW調査団
- (4) 面談概要：
 - ・調査団の訪問目的、団員紹介、SW趣旨説明(団長)。
 - ・100千t/yへの拡張計画に伴うF/Sを本体P/Jに含める問題、堆積場キャッピングの問題の2点についてOMCO意見確認(団長)。

- ・ 100 千 t/y 拡張計画には、原料の手当、硫酸（石膏）マーケット、ローン等問題が多い。Just Idea の段階。40 千 t/y までの拡張は将来の市場性も見込め期待している (Ali)。
- ・ 40 千 t/y までの拡張計画に関するトーメンの document は chairman 経由で入手の上提供可、しかし document ではなく紙 1 枚 (Ali)。
- ・ 堆積場カバーの件は 1997 年に指示を受けた (Ali)。
- ・ 2000 年第 1 四半期に工事開始する (Ali)。
- ・ 12 百万トンの廃屑にまだ塩分の 80%が残っている。浸透水で地下水おせんが進行中。カバーはとりあえずの緊急措置として実施。将来覆土も必要 (Ali)。
- ・ 耐熱、安価な面からヴィチュメスチック (アスファルト系)の採用も検討している (Ali)。
- ・ 堆積場カバーに関する Tender Document の写しの提供を依頼し了解を取り付け (団)。聞き取り調査の現地再委託は MWR Sohar 事務所で相談するようリコメンあり。明日の訪問をアレンジしてもらう (Ali)。
- ・ Local Wari (Local Governor) とのインタビューの set も有効 (Ali)
- ・ OMCO はボーリングを実施しておらず、ボーリング業者のリスト提供依頼 (団)。
- ・ OMCO Labo で HCO_3^- 分析可 (汚染物質ではないので、現在分析していないが) (Barry)。
- ・ DF/R に関するコメントを 1 ヶ月以内に返すことは難しい (SW について) (Ali)。
- ・ Mr. Qassim は OK している (団長)。

8. 水資源省 (MWR) Sohar

- (1) 日時： 平成 11 年 10 月 27 日、 9:00~10:30
- (2) 面談相手： Salem Hameed Al-Shibli 局長、Fahad Ali Alsadi ネットワークモニタリング課課長
- (3) 面談者： SW 調査団
- (4) 面談概要：
 - ・ 調査団の訪問目的、団員紹介、SW 趣旨説明 (団長)。
 - ・ モニタリングデータの月別報告を受けており、汚染に関するほとんどの資料を持っている (Salem)。
 - ・ 分析は、MWR、MRME、OMCO の 3 者で実施している。MWR SOHAR には分析所はない。
 - ・ 汚染を認識した時点、汚染前と汚染後の水供給システムの変更、利水状況について質問 (団)。
 - ・ 汚染は住民からのクレームで'80 年代はじめころと考える。井戸データは 1983 年頃から所有している。汚染前には、水は飲料はじめすべてに利用していた (Salem)।'85 から飲料を中止した。
 - ・ 資料は次のところで入手できる (Salem)。

- ・Ground Water Pollution Department of MRME.
 - ・Library of MWR : D.G. of Information Center and Awareness
 - ・Sohar Wari Office
 - ・'97 に consultant office が residents の interview を実施した。メンバーは'94 に、MWR、MRME 等で構成された (Salem)。
 - ・利水状況、汚染前後の状況を示す資料は下記で調査されたい (Salem)。
 - ・ Ministry of Agriculture : D.G. of Al-Batinah (North)、D.G. of Agricultural and Fisheries、Khaleefa Al-kumii
 - ・ Ministry of Municipalities : Department of Ground Water (Muscat)
 - ・ Ministry of Health : D.G. of Health services in North Al-Batinah
- また、MWR の図書館に本調査関連資料がある。MCI から下記へ letter を出せば閲覧できる。
- ・D.G. of Information Center and Awareness (MWR)

9. 水資源省 (MWR) Sohar

- (1) 日時： 平成 11 年 10 月 27 日、12:30～14:00
- (2) 面談相手： Salem Hameed Al-Shibli 局長 (salimshb@gto.net.om)、Fahad Ali Alsadi 課長
- (3) 面談者： 早川、大木
- (4) 面談概要：
 - ・プロ形調査時に依頼していた井戸データをフロッピーで受領(一部未完、後日 Muscat または東京へ Fax される)

10. オマーン鉱山会社 (OMCO) Sohar

- (1) 日時： 平成 11 年 10 月 28 日、10:00～12:00
- (2) 面談相手： Ali Said Abdullah Al-Waily 副所長、製錬担当技師(10:00～10:25)、Najeeb Al-Sabahi 技師
- (3) 面談者： SW 調査団
- (4) 面談概要：
 - questionnaire 回答の確認
 - ①大気、土壌関係項目(No. 7～No.10)
 - ・ 移動型 SO2 モニタリング設備は開山当初 ('83) から使用しており古く、提案の 15km 地点、20km 地点の測定には調査団で機材を用意する必要がある。
 - ・ 粉塵測定機器もハイレベルサンプラーしかないので、団で用意が必要。
 - ・ モニタリング位置には電源がないので、バッテリーあるいは発電器が必要。
 - ②水質関係

- ・ボーリング柱状図は所有していない。コアに関してもボーリングの目的が違うので MWR においても整理され保管されているか不明。MCI を通じ確認願う。なお、調査地域の地質状況に関する参考資料として下記がある。
 - BATINAH COSTAL REGEON and RAKI-HAYL AS SAFIL AREA AIRBONE GEOPHYSICAL PROJECT 1992
EXPLANATORY NOTES ON THE SOLID GEOLOGICAL INTERPRETATION OF SOHAR 1:100,000 SHEET NG40-14F, and part of AL WASIT 1:100,000 SHEET NG40-14E (World Geoscience Corporation) (表紙コピーのみ提供を受ける)
- ・農業、牧畜、漁業、人体影響データはない。
 - Environmental Impact of Oman Mining Company (March 1993)の提供あり。
- ・ OMCO の環境関連組織表入手
- ・堆積場被覆計画の実施に至る経緯 (cabinet 通過～proposal 作成) 質問 (団長)。
- ・1997 年の cabinet の決定以来、政府の機構改革、OMCO の management の交代、一旦 set された Finance の再検討等紆余曲折があり時間がかかった (Ali)。
- ・調査地域への立ち入り等の clearance 依頼 (団長)。
- ・SW 案の第Ⅷ項 2 (2)記載内容を確認 (Ali)
- ・水試料分析について、OMCO は 3,000samples/月 (内環境関連 60%) 実施しており、手一杯。民間企業の利用をリコメンド (Ali)。
 - Winpey Alawi L.L.C. Tel : 590347
 - Laboratory of Oman Al-Kuwair Tel : 591662

収集資料リスト

- ・ Ground Water Pollution and Remediation Project, Sep. 1999, OMCO
- ・ Environmental Impact of Oman Mining Company, March 1993, OMCO
- ・ MONTHLY ENVIRONMENTAL REPORT SEPTEMBER 1999/OMAN MINING COMPANY LLC
- ・ OPERATIONAL, PROCESSING AND IMAGE PROCESSING REPORT ON AIRBORNE GEOPHYSICAL SURVEY OF BATINAH COSTAL REGION AND RAKI · HAYL AS SAFIL (YANQUL · DANK) AREAS FOR DIRECTORATE GENERAL OF MINERALS, WORLD GEOSCIENCECORPORATION LIMITED
- ・ LALBUKSH IRRIGATION & DRILLING CO., LLC (Company Brochure)
- ・ Drilling Cost Estimation of Lalbuksh Irrigation & Drilling CO., LLC.
- ・ Tarmac Alawi Laboratories Division of TARMAC ALAWI LLC.
- ・ Analysis Cost List of Tarmac Alawi Lab.

TS-6.XLS

TS-6		DB690707AA						
DATE	WL.ELEVATION	SWL	DATE	WL.ELEV	SWL	DATE	WL.ELEV	SWL
Jan.82	10.344	25.090	Apr.86	10.694	24.740	Jul.90	11.624	23.810
Feb.82	10.244	25.190	May.86	10.524	24.910	Aug.90	11.514	23.920
Mar.82		35.434	Jun.86	10.414	25.020	Sep.90	11.874	23.560
Apr.82	10.314	25.120	Jul.86	10.264	25.170	Oct.90	11.884	23.550
May.82	10.424	25.010	Aug.86	10.154	25.280	Nov.90		35.434
Jun.82	10.484	24.950	Sep.86	10.064	25.370	Dec.90	11.984	23.450
Jul.82	10.484	24.950	Oct.86	9.944	25.490	Jan.91	11.944	23.490
Aug.82	10.474	24.960	Nov.86		35.434	Feb.91	12.024	23.410
Sep.82	10.434	25.000	Dec.86	9.824	25.610	Mar.91	12.044	23.390
Oct.82	10.454	24.980	Jan.87	9.734	25.700	Apr.91	12.054	23.380
Nov.82		35.434	Feb.87	9.054	26.380	May.91	12.154	23.280
Dec.82		35.434	Mar.87	9.504	25.930	Jun.91	12.404	23.030
Jan.83		35.434	Apr.87	9.434	26.000	Jul.91	12.244	23.190
Feb.83	10.564	24.870	May.87	9.394	26.040	Aug.91	12.274	23.160
Mar.83	9.664	25.770	Jun.87	9.304	26.130	Sep.91	12.554	22.880
Apr.83		35.434	Jul.87	9.254	26.180	Oct.91	12.334	23.100
May.83	11.034	24.400	Aug.87	9.164	26.270	Nov.91	12.534	22.900
Jun.83	11.194	24.240	Sep.87	8.654	26.780	Dec.91	12.334	23.100
Jul.83	11.434	24.000	Oct.87	9.044	26.390	Jan.92	12.384	23.050
Aug.83		35.434	Nov.87	8.974	26.460	Feb.92	12.474	22.960
Sep.83	11.514	23.920	Dec.87	8.911	26.523	Mar.92	12.484	22.950
Oct.83		35.434	Jan.88	8.854	26.580	Apr.92	12.534	22.900
Nov.83	11.674	23.760	Feb.88	8.844	26.590	May.92	12.584	22.850
Dec.83		35.434	Mar.88	8.914	26.520	Jun.92	12.604	22.830
Jan.84	11.864	23.570	Apr.88	9.064	26.370	Jul.92	12.604	22.830
Feb.84	11.944	23.490	May.88	9.204	26.230	Aug.92	12.554	22.880
Mar.84		35.434	Jun.88	9.404	26.030	Sep.92	12.674	22.760
Apr.84	12.034	23.400	Jul.88	9.514	25.920	Oct.92	12.484	22.950
May.84	11.464	23.970	Aug.88	9.614	25.820	Nov.92	12.414	23.020
Jun.84		35.434	Sep.88	9.574	25.860	Dec.92	12.374	23.060
Jul.84	12.204	23.230	Oct.88	9.744	25.690	Jan.93	12.344	23.090
Aug.84		35.434	Nov.88	9.794	25.640	Feb.93	12.264	23.170
Sep.84	12.224	23.210	Dec.88	9.844	25.590	Mar.93	12.184	23.250
Oct.84	12.254	23.180	Jan.89	9.894	25.540	Apr.93	12.104	23.330
Nov.84	12.284	23.150	Feb.89	9.974	25.460	May.93	12.054	23.380
Dec.84	12.254	23.180	Mar.89	9.934	25.500	Jun.93	11.964	23.470
Jan.85	12.254	23.180	Apr.89	10.114	25.320	Jul.93	11.874	23.560
Feb.85	12.244	23.190	May.89	10.254	25.180	Aug.93	11.734	23.700
Mar.85	12.164	23.270	Jun.89		35.434	Sep.93	11.674	23.760
Apr.85	12.144	23.290	Jul.89	10.344	25.090	Oct.93	11.774	23.660
May.85	12.064	23.370	Aug.89	10.484	24.950	Nov.93	11.694	23.740
Jun.85	12.064	23.370	Sep.89	10.514	24.920	Dec.93	11.584	23.850
Jul.85	11.844	23.590	Oct.89	10.494	24.940	Jan.94	11.334	24.100
Aug.85		35.434	Nov.89	10.484	24.950	Feb.94	11.314	24.120
Sep.85		35.434	Dec.89	10.754	24.680	Mar.94	11.334	24.100
Oct.85		35.434	Jan.90	10.874	24.560	Apr.94	11.154	24.280
Nov.85	11.414	24.020	Feb.90	10.944	24.490	May.94	11.094	24.340
Dec.85	11.304	24.130	Mar.90	11.234	24.200	Jun.94	10.984	24.450
Jan.86	10.614	24.820	Apr.90		35.434	Jul.94	11.124	24.310
Feb.86	10.974	24.460	May.90	11.544	23.890	Aug.94	11.084	24.350
Mar.86	10.844	24.590	Jun.90	11.684	23.750	Sep.94	10.854	24.580
Nov.94	10.584	24.850	Feb.99	14.204	21.230			
Dec.94	10.564	24.870	Mar.99	14.344	21.090			
Jan.95	10.294	25.140	Apr.99	14.314	21.120			
Feb.95	9.354	26.080	May.99	14.434	21.000			
Mar.95	10.234	25.200	Jun.99	14.534	20.900			
Apr.95	10.154	25.280	Jul.99	14.624	20.810			
May.95	9.854	25.580	Aug.99	14.634	20.800			
Jun.95	9.904	25.530	Sep.99	14.684	20.750			
Jul.95	9.924	25.510	Oct.99	14.704	20.73			
Aug.95	9.624	25.810						
Sep.95	9.794	25.640						
Oct.95	9.694	25.740						
Nov.95	9.574	25.860						
Dec.95	9.334	26.100						
Jan.96	9.334	26.100						

Feb.96	9.454	25.980					
Mar.96	9.554	25.880					
Apr.96	9.784	25.650					
May.96	9.994	25.440					
Jun.96	9.994	25.440					
Jul.96	9.964	25.470					
Aug.96	9.894	25.540					
Sep.96	10.384	25.050					
Oct.96	10.454	24.980					
Nov.96	12.494	22.940					
Dec.96	10.614	24.820					
Jan.97	10.684	24.750					
Feb.97	10.784	24.650					
Mar.97	10.954	24.480					
Apr.97	11.124	24.310					
May.97	11.194	24.240					
Jun.97	11.314	24.120					
Jul.97	11.434	24.000					
Aug.97	11.554	23.880					
Sep.97	11.554	23.880					
Oct.97	11.734	23.700					
Nov.97		35.434					
Dec.97	11.804	23.630					
Jan.98	12.234	23.200					
Feb.98	12.514	22.920					
Mar.98	12.754	22.680					
Apr.98	12.994	22.440					
May.98	12.934	22.500					
Jun.98	13.254	22.180					
Jul.98	13.384	22.050					
Aug.98	13.514	21.920					
Sep.98	13.824	21.610					
Oct.98	13.744	21.690					
Nov.98	13.844	21.590					
Dec.98	13.934	21.500					
Jan.99	14.114	21.320					

J&PDRUM.XLS

J & P 4/5 (Drum)	DB598742AA				
GS Elev. = 40.731 masl				Date	
Date	WL Elev. (masl)			23.4.84	5000
Jan.82				26.5.84	
Feb.82	26.371			26.6.84	
Mar.82				3.7.84	4600
Apr.82	26.511			11.6.87	4095
May.82	26.581			16.7.87	4221
Jun.82	26.651			1.12.87	4778
Jul.82	26.671			6.1.92	4034
Aug.92	26.691			9.2.92	
Sep.82	26.681			4.3.92	
Oct.82	26.701			3.4.92	
Nov.82	26.701			4.5.92	
Dec.82				7.6.92	4300
Jan.83	26.741			8.7.92	4500
Feb.83	26.801			4.8.92	4380
Mar.83	26.841			2.9.92	4400
Apr.83	26.911			4.10.92	4380
May.83	27.031			7.11.92	4350
Jun.83	27.091			5.12.92	
Jul.83	27.131			4.1.93	4400
Aug.83				2.2.93	
Sep.83	27.121			3.3.93	4410
Oct.83				4.4.93	4430
Nov.83	27.111			3.5.93	4490
Dec.83				6.6.93	4490
Jan.84	27.081			11.7.93	4470
Feb.84	27.051			14.8.93	4580
Mar.84				13.9.93	
Apr.84	27.041			12.10.93	4580
May.84	26.791			13.11.93	4580
Jun.84				13.12.93	4580
Jul.84	27.031			15.1.94	4640
Aug.84				6.2.94	4630
Sep.94	26.971			6.3.94	4680
Oct.84	26.941			11.4.94	4750
Nov.84	26.911			9.5.94	4770
Dec.84	26.861			8.6.94	4730
Jan.85	26.861			6.7.94	4670
Feb.85	26.861			9.8.94	4770
Mar.85	26.811			17.9.94	4770
Apr.85	26.821			5.10.94	4840
May.85	26.791			7.11.94	4850

J&PDRUM.XLS

Jun.85	26.801			12.12.94	4890
Jul.85	26.781			8.1.95	4900
Aug.85	26.771			8.2.95	4950
Sep.85	26.731			15.3.95	4970
Oct.85	26.701			8.4.95	4880
Nov.85	26.661			8.5.95	4920
Dec.85	26.631			10.6.95	4980
Jan.86	26.611			8.7.95	4950
Feb.86	26.621			8.8.95	4970
Mar.86	26.611			6.9.95	5050
Apr.86	26.591			7.10.95	4950
May.86	26.571			6.11.95	5030
Jun.86	26.571			6.12.95	5100
Jul.86	26.571			6.1.96	1700
Aug.86	26.581			6.2.96	2330
Sep.86	26.551			4.3.96	2610
Oct.86	26.521			6.4.96	3310
Nov.86	26.521			8.5.96	3260
Dec.86	26.501			5.6.96	3500
Jan.87	26.471			7.7.96	3770
Feb.87	26.311			10.8.96	3930
Mar.87	26.481			10.9.96	4150
Apr.87	26.491			12.10.96	4270
May.87	26.631			6.11.96	4420
Jun.87	26.641			14/12/96	4640
Jul.87	26.601			14/1/96	4530
Aug.87	26.571			18/2/96	3400
Sep.87	26.551			29/3/97	5180
Oct.87	26.541			27/4/97	5330
Nov.87	26.501			17/5/97	5220
Dec.87	26.451				
Jan.88	26.451				
Feb.88	26.451				
Mar.88	26.731				
Apr.88	26.911				
May.88	26.991				
Jun.88	27.061				
Jul.88	27.091				
Aug.88	27.101				
Sep.88	27.081				
Oct.88	27.091				
Nov.88	27.111				
Dec.88	27.111				
Jan.89	27.161				

J&PDRUM.XLS

Feb.89	27.171				
Mar.89	27.181				
Apr.89	27.191				
May.89	27.211				
Jun.89	27.211				
Jul.89	27.181				
Aug.89	27.201				
Sep.89	27.211				
Oct.89	27.131				
Nov.89	27.101				
Dec.89	27.081				
Jan.90	27.131				
Feb.90	27.201				
Mar.90	27.261				
Apr.90	27.281				
May.90	27.271				
Jun.90	27.251				
Jul.90	27.271				
Aug.90	27.261				
Sep.90	27.251				
Oct.90	27.221				
Nov.90	27.221				
Dec.90	27.221				
Jan.91	27.171				
Feb.91	27.201				
Mar.91	27.211				
Apr.91	27.231				
May.91	27.231				
Jun.91	27.261				
Jul.91	27.271				
Aug.91	27.281				
Sep.91	27.151				
Oct.91	27.131				
Nov.91	27.081				
Dec.91	27.241				
Jan.92	27.171				
Feb.92	27.431				
Mar.92	27.381				
Apr.92	27.491				
May.92	27.361				
Jun.92	27.431				
Jul.92	27.571				
Aug.92	27.561				
Sep.92	27.601				
Oct.92	27.591				
Nov.92	27.561				
Dec.92	27.611				
Jan.93	27.631				
Feb.93	27.831				
Mar.93	27.641				
Apr.93	27.661				
May.93	27.691				
Jun.93	27.721				
Jul.93	27.761				

J&PDRUM.XLS

Aug.93	27.751			
Sep.93	27.771			
Oct.93	27.751			
Nov.93	27.761			
Dec.93	27.731			
Jan.94	27.761			
Feb.94	27.671			
Mar.94	27.861			
Apr.94	27.891			
May.94	27.921			
Jun.94	27.921			
Jul.94	27.951			
Aug.94	27.951			
Sep.94	27.901			
Oct.94	27.911			
Nov.94	27.861			
Dec.94	27.861			
Jan.95	27.851			
Feb.95	27.861			
Mar.95	27.88			
Apr.95	27.891			
May.95	27.871			
Jun.95	27.881			
Jul.95	27.881			
Aug.95	28.011			
Sep.95	28.001			
Oct.95	27.961			
Nov.95	27.931			
Dec.95	27.891			
Jan.96	28.07			
Feb.96	28.171			
Mar.96	28.281			
Apr.96	28.331			
May.96	28.421			
Jun.96	28.501			
Jul.96	28.511			
Aug.96	28.661			
Sep.96	28.761			
Oct.96	28.731			
Nov.96	28.731			
Dec.96	29.031			
Jan.97	28.881			
Feb.97	29.091			
Mar.97	29.351			
Apr.97	29.411			
May.97	29.461			
Jun.97	29.340			
Jul.97	29.300			
Aug.97	29.540			
Sep.97	29.530			
Oct.97	29.500			
Nov.97				
Dec.97	29.510			
Jan.98	29.520			

J&PDRUM.XLS

Feb.98	29.580				
Mar.98	29.630				
Apr.98	29.480				
May.98	29.510				
Jun.98	29.720				
Jul.98	29.690				
Aug.98	29.680				
Sep.98					
Oct.98					
Nov.98					
Dec.98					

Jul.85				14.7.93	734
Aug.85				14.7.93	734
Sep.85				15.1.94	872
Oct.85	1.024	9.43		6.7.94	915
Nov.85	0.994	9.46		9.8.94	1084
Dec.85	0.994	9.46		14.9.94	980
Jan.86	1.014	9.44		7.11.94	1031
Feb.86	1.004	9.45		12.12.94	1042
Mar.86	0.984	9.47		8.1.95	1080
Apr.86	0.934	9.52		8.2.95	1091
May.86	0.834	9.62		15.3.95	1111
Jun.86	0.664	9.79		8.4.95	1124
Jul.86	0.584	9.87		8.5.95	1130
Aug.86	0.514	9.94		10.6.95	1125
Sep.86	0.464	9.99		8.7.95	1138
Oct.86	0.414	10.04		8.8.95	1115
Nov.86	0.404	10.05		6.9.95	1126
Dec.86	0.414	10.04		7.10.95	1136
Jan.87	0.484	9.97		6.11.95	1164
Feb.87	0.474	9.98		6.12.95	1236
Mar.87	0.504	9.95		8.1.96	1136
Apr.87	0.544	9.91		6.2.96	1262
May.87	0.384	10.07		4.3.96	1147
Jun.87	0.284	10.17		6.4.96	1350
Jul.87	0.184	10.27		8.5.96	1141
Aug.87	0.104	10.35		5.6.96	1152
Sep.87	0.024	10.43		7.7.96	1176
Oct.87	0.044	10.41		10.8.96	1190
Nov.87	0.044	10.41		10.9.96	1221
Dec.87	0.074	10.38		12.10.96	1200
Jan.88	0.134	10.32		14/12/96	1218
Feb.88	0.124	10.33		14/1/97	1230
Mar.88	0.954	9.5		18/2/97	1500
Apr.88	0.984	9.47		29/3/97	1466
May.88	1.014	9.44		27/4/97	1256
Jun.88	0.844	9.61		17/5/97	1200
Jul.88	0.694	9.76		16/6/97	1200
Aug.88	0.654	9.8		98/5/20	1092
Sep.88	0.654	9.8		98/6/21	1160
Oct.88	0.654	9.8		98/12/19	1140
Nov.88	0.704	9.75		04.12.99	991
Dec.88	0.754	9.7		05.09.99	982
Jan.89	0.854	9.6		06.12.99	975
Feb.89	0.914	9.54		07.13.99	990
Mar.89	0.934	9.52		08.10.99	980
Apr.89	1.004	9.45		09.11.99	980
May.89	0.884	9.57		10.10.99	995

Jun.89	0.754	9.7		
Jul.89	0.704	9.75		
Aug.89	0.724	9.73		
Sep.89	0.724	9.73		
Oct.89	0.714	9.74		
Nov.89	0.884	9.57		
Dec.89	1.064	9.39		
Jan.90	1.214	9.24		
Feb.90	1.444	9.01		
Mar.90	1.584	8.87		
Apr.90	1.554	8.9		
May.90	1.404	9.05		
Jun.90	1.214	9.24		
Jul.90	1.104	9.35		
Aug.90	1.054	9.4		
Sep.90	1.064	9.39		
Oct.90	1.074	9.38		
Nov.90	1.134	9.32		
Dec.90	1.184	9.27		
Jan.91	1.244	9.21		
Feb.91	1.284	9.17		
Mar.91	1.254	9.2		
Apr.91	1.144	9.31		
May.91	1.004	9.45		
Jun.91	1.134	9.32		
Jul.91	1.084	9.37		
Aug.91	1.124	9.33		
Sep.91	1.144	9.31		
Oct.91	1.154	9.3		
Nov.91	1.154	9.3		
Dec.91	1.264	9.19		
Jan.92	1.384	9.07		
Feb.92	1.554	8.9		
Mar.92	1.514	8.94		
Apr.92	1.464	8.99		
May.92	1.464	8.99		
Jun.92	1.094	9.36		
Jul.92	0.914	9.54		
Aug.92	0.864	9.59		
Sep.92	0.834	9.62		
Oct.92	0.794	9.66		
Nov.92	0.804	9.65		
Dec.92	0.854	9.6		
Jan.93	0.955	9.499		
Feb.93	0.934	9.52		
Mar.93	0.934	9.52		
Apr.93	0.844	9.61		

May.93	0.686	9.768		
Jun.93	0.504	9.95		
Jul.93	0.364	10.09		
Aug.93	0.334	10.12		
Sep.93	0.274	10.18		
Oct.93	0.254	10.2		
Nov.93	0.244	10.21		
Dec.93	0.334	10.12		
Jan.94	0.514	9.94		
Feb.94	0.614	9.84		
Mar.94	0.554	9.9		
Apr.94	0.534	9.92		
May.94	0.354	10.1		
Jun.94	0.114	10.34		
Jul.94	0.024	10.43		
Aug.94	0.046	10.408		
Sep.94	0.086	10.368		
Oct.94	0.116	10.338		
Nov.94	0.126	10.328		
Dec.94	0.116	10.338		
Jan.95	0.086	10.368		
Feb.95	0.066	10.388		
Mar.95	0.024	10.43		
Apr.95	0.106	10.348		
May.95	0.256	10.198		
Jun.95	0.406	10.048		
Jul.95	0.466	9.988		
Aug.95	0.346	10.108		
Sep.95	0.446	10.008		
Oct.95	0.406	10.048		
Nov.95	0.446	10.008		
Dec.95	0.436	10.018		
Jan.96	0.074	10.38		
Feb.96	0.324	10.13		
Mar.96	0.404	10.05		
Apr.96	0.494	9.96		
May.96	0.254	10.2		
Jun.96	0.094	10.36		
Jul.96	0.026	10.428		
Aug.96	0.096	10.358		
Sep.96	0.096	10.358		
Oct.96	0.026	10.428		
Nov.96	0.024	10.43		
Dec.96	0.164	10.29		
Jan.97	0.324	10.13		

Feb.97	0.464	9.99			
Mar.97	0.564	9.89			
Apr.97	0.684	9.77			
May.97	0.534	9.92			
Jun.97	0.414	10.04			
Jul.97	0.414	10.04			
Aug.97	0.474	9.98			
Sep.97	0.244	10.21			
Oct.97	0.654	9.8			
Nov.97		10.454			
Dec.97	1.094	9.36			
Jan.98	1.184	9.27			
Feb.98	1.364	9.09			
Mar.98	1.174	9.28			
Apr.98	1.334	9.12			
May.98	1.194	9.26			
Jun.98	1.044	9.41			
Jul.98	1.024	9.43			
Aug.98	0.744	9.71			
Sep.98	0.814	9.64			
Oct.98	1.124	9.33			
Nov.98	1.194	9.26			
Dec.98	1.054	9.4			
Jan.99	1.504	8.95			
Feb.99	1.574	8.88			
Mar.99	1.884	8.57			
Apr.99	1.794	8.66			
May.99	1.564	8.89			
Jun.99	1.184	9.27			
Jul.99	1.374	9.08			

HS-10-B	DN604232BA			Date	EC
Jul.85				14.7.93	1415
Aug.85				15.1.94	1404
Sep.85				9.8.94	1492
Oct.85	1.013			14.9.94	1595
Nov.85	1.033			14.9.94	1383
Dec.85	1.003			5.10.94	
Jan.86	1.023			7.11.94	1303
Feb.86	1.013			12.12.94	1246
Mar.86	0.993			8.1.95	1235
Apr.86	0.943			8.2.95	1253
May.86	0.843			15.3.95	1160
Jun.86	0.663			8.4.95	1118
Jul.86	0.593			8.5.95	1138
Aug.86	0.513			10.6.95	1143
Sep.86	0.453			8.7.95	1151
Oct.86	0.433			8.8.95	1286
Nov.86	0.413			6.9.95	1276
Dec.86	0.413			7.10.95	1258
Jan.87	0.483			6.11.95	1247
Feb.87	0.473			6.12.95	1249
Mar.87	0.513			8.1.96	1220
Apr.87	0.533			6.2.96	1246
May.87	0.393			4.3.96	1172
Jun.87	0.293			6.4.96	1350
Jul.87	0.193			2.5.96	1203
Aug.87	0.103			5.6.96	1230
Sep.87	0.053			7.7.96	1282
Oct.87	0.043			10.8.96	1320
Nov.87	0.033			10.9.96	1290
Dec.87	0.083			12.10.96	1290
Jan.88	0.143			14/12/96	1258
Feb.88	0.133			14/1/96	1270
Mar.88	0.953			18/2/96	2130
Apr.88	1.003			29/3/97	1329
May.88	1.023			22/4/97	1219
Jun.88	0.853			17/5/97	1230
Jul.88	0.703			16/6/97	1150
Aug.88	0.673			1998.5.20	1150
Sep.88	0.653			1998.6.21	1160
Oct.88	0.653			1998.12.19	1140
Nov.88	0.713			1999.4.12	1085
Dec.88	0.763			1999.5.9	1088
Jan.89	0.853			1999.6.12	1060
Feb.89	0.923			1999.7.13	1078
Mar.89	0.953			1999.8.10	1080

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Apr.89	1.013			1999.9.11	1089
May.89	0.893			1999.10.10	1091
Jun.89	0.773				
Jul.89	0.623				
Aug.89	0.723				
Sep.89	0.733				
Oct.89	0.743				
Nov.89	0.883				
Dec.89	1.063				
Jan.90	1.213				
Feb.90	1.443				
Mar.90	1.603				
Apr.90	1.583				
May.90	1.423				
Jun.90	1.233				
Jul.90	1.113				
Aug.90	1.063				
Sep.90	1.073				
Oct.90	1.093				
Nov.90	1.153				
Dec.90	1.203				
Jan.91	1.253				
Feb.91	1.313				
Mar.91	1.353				
Apr.91	1.053				
May.91	1.053				
Jun.91	1.143				
Jul.91	1.093				
Aug.91	1.113				
Sep.91	1.163				
Oct.91	1.153				
Nov.91	1.203				
Dec.91	1.273				
Jan.92	1.403				
Feb.92	1.553				
Mar.92	1.533				
Apr.92	1.483				
May.92	1.353				
Jun.92	1.103				
Jul.92	0.933				
Aug.92	0.873				
Sep.92	0.843				
Oct.92	0.803				
Nov.92	0.813				
Dec.92	0.873				
Jan.93	0.963				

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Feb.93	0.953				
Mar.93	0.953				
Apr.93	0.853				
May.93	0.703				
Jun.93	0.513				
Jul.93	0.373				
Aug.93	0.333				
Sep.93	0.273				
Oct.93	0.263				
Nov.93	0.253				
Dec.93	0.343				
Jan.94	0.523				
Feb.94	0.633				
Mar.94	0.563				
Apr.94	0.543				
May.94	0.353				
Jun.94	0.143				
Jul.94	0.033				
Aug.94	0.027				
Sep.94	-0.057				
Oct.94	-0.107				
Nov.94	-0.117				
Dec.94	-0.127				
Jan.95	-0.067				
Feb.95	-0.057				
Mar.95	-0.033				
Apr.95	-0.097				
May.95	-0.237				
Jun.95	-0.397				
Jul.95	-0.457				
Aug.95	-0.337				
Sep.95	-0.447				
Oct.95	-0.507				
Nov.95	-0.447				
Dec.95	-0.407				
Jan.96	0.083				
Feb.96	0.313				
Mar.96	0.413				
Apr.96	0.493				
May.96	0.293				
Jun.96	0.083				
Jul.96	-0.027				
Aug.96	-0.097				
Sep.96	-0.087				
Oct.96	-0.027				
Nov.96	-0.033				
Dec.96	0.033				

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Jan.97	0.323				
Feb.97	0.453				
Mar.97	0.633				
Apr.97	0.703				
May.97	0.573				
Jun.97	0.453				
Jul.97	0.423				
Aug.97	0.503				
Sep.97	0.503				
Oct.97	0.713				
Nov.97					
Dec.97	1.093				
Jan.98	1.213				
Feb.98	1.373				
Mar.98	1.203				
Apr.98	1.353				
May.98	1.223				
Jun.98	1.073				
Jul.98	1.023				
Aug.98	0.773				
Sep.98	0.843				
Oct.98	1.143				
Nov.98	1.203				
Dec.98	1.093				
Jan.99	1.553				
Feb.99	1.653				
Mar.99	1.883				
Apr.99	1.823				
May.99	1.623				
Jun.99	1.213				
Jul.99	1.403				

HS-10-C.XLS

HS-10-C	DN604232CA		Date	EC
Jul.85			14.7.93	542
Aug.85			15.1.94	621
Sep.85			6.7.94	567
Oct.85			9.8.94	600
Nov.85	1.040	9.450	14.9.94	598
Dec.85	1.010	9.480	7.11.94	545
Jan.86	1.030	9.460	12.12.94	553
Feb.86	1.020	9.470	8.1.95	555
Mar.86	1.000	9.490	8.2.95	559
Apr.86	0.940	9.550	15.3.95	556
May.86	0.840	9.650	8.4.95	552
Jun.86	0.670	9.820	8.5.95	561
Jul.86	0.590	9.900	10.6.95	566
Aug.86	0.520	9.970	8.7.95	569
Sep.86	0.470	10.020	8.8.95	550
Oct.86	0.440	10.050	6.9.95	554
Nov.86	0.420	10.070	7.10.95	553
Dec.86	0.430	10.060	6.11.95	557
Jan.87	0.500	9.990	6.12.95	684
Feb.87	0.490	10.000	8.1.96	577
Mar.87	0.530	9.960	6.2.96	628
Apr.87	0.580	9.910	4.3.96	567
May.87	0.390	10.100	6.4.96	670
Jun.87	0.290	10.200	8.5.96	567
Jul.87	0.200	10.290	5.6.96	571
Aug.87	0.110	10.380	7.7.96	590
Sep.87	0.060	10.430	10.8.96	572
Oct.87	0.070	10.420	10.9.96	579
Nov.87	0.060	10.430	12.10.96	590
Dec.87	0.100	10.390	10.11.96	
Jan.88	0.140	10.350	14/12/96	536
Feb.88	0.140	10.350	14/1/96	560
Mar.88	0.990	9.500	18/2/96	470
Apr.88	1.030	9.460	24/3/97	630
May.88	1.030	9.460	27/4/97	595
Jun.88	0.850	9.640	17/5/97	560
Jul.88	0.710	9.780	1998.5.20	572
Aug.88	0.690	9.800	1998.6.21	630
Sep.88	0.660	9.830	1999.12.19	590
Oct.88	0.670	9.820	1999.4.12	617
Nov.88	0.730	9.760	1999.5.9	604
Dec.88	0.770	9.720	1999.6.12	640
Jan.89	0.870	9.620	1999.7.15	604
Feb.89	0.940	9.550	1999.8.10	610
Mar.89	0.970	9.520	1999.9.11	608
Apr.89	1.030	9.460	1999.10.10	609

HS-10-C.XLS

May.89	0.890	9.600			
Jun.89	0.770	9.720			
Jul.89	0.630	9.860			
Aug.89	0.740	9.750			
Sep.89	0.750	9.740			
Oct.89	0.730	9.760			
Nov.89	0.890	9.600			
Dec.89	1.080	9.410			
Jan.90	1.230	9.260			
Feb.90	1.460	9.030			
Mar.90	1.600	8.890			
Apr.90	1.580	8.910			
May.90	1.400	9.090			
Jun.90	1.220	9.270			
Jul.90	1.110	9.380			
Aug.90	1.060	9.430			
Sep.90	1.070	9.420			
Oct.90	1.090	9.400			
Nov.90	1.140	9.350			
Dec.90	1.200	9.290			
Jan.91	1.270	9.220			
Feb.91	1.300	9.190			
Mar.91	1.340	9.150			
Apr.91	1.140	9.350			
May.91	1.030	9.460			
Jun.91	1.150	9.340			
Jul.91	1.090	9.400			
Aug.91	1.130	9.360			
Sep.91	1.150	9.340			
Oct.91	1.160	9.330			
Nov.91	1.190	9.300			
Dec.91	1.290	9.200			
Jan.92	1.390	9.100			
Feb.92	1.550	8.940			
Mar.92	1.530	8.960			
Apr.92	1.480	9.010			
May.92	1.330	9.160			
Jun.92	1.090	9.400			
Jul.92	0.930	9.560			
Aug.92	0.870	9.620			
Sep.92	0.840	9.650			
Oct.92	0.800	9.690			
Nov.92	0.820	9.670			
Dec.92	0.820	9.670			
Jan.93	0.970	9.520			
Feb.93	0.940	9.550			
Mar.93	0.950	9.540			

HS-10-C.XLS

Apr.93	0.860	9.630			
May.93	0.700	9.790			
Jun.93	0.510	9.980			
Jul.93	0.390	10.100			
Aug.93	0.340	10.150			
Sep.93	0.300	10.190			
Oct.93	0.280	10.210			
Nov.93	0.280	10.210			
Dec.93	0.360	10.130			
Jan.94	0.550	9.940			
Feb.94	0.620	9.870			
Mar.94	0.580	9.910			
Apr.94	0.550	9.940			
May.94	0.360	10.130			
Jun.94	0.140	10.350			
Jul.94	0.060	10.430			
Aug.94	-0.010	10.500			
Sep.94	-0.060	10.550			
Oct.94	-0.080	10.570			
Nov.94	-0.090	10.580			
Dec.94	-0.07	10.560			
Jan.95	-0.05	10.540			
Feb.95	-0.03	10.520			
Mar.95	0.06	10.430			
Apr.95	-0.08	10.570			
May.95	-0.24	10.730			
Jun.95	-0.37	10.860			
Jul.95	-0.43	10.920			
Aug.95	-0.31	10.800			
Sep.95	-0.41	10.900			
Oct.95	-0.47	10.960			
Nov.95	-0.41	10.900			
Dec.95	-0.39	10.880			
Jan.96	0.110	10.380			
Feb.96	0.340	10.150			
Mar.96	0.440	10.050			
Apr.96	0.520	9.970			
May.96	0.310	10.180			
Jun.96	0.120	10.370			
Jul.96	-0.010	10.500			
Aug.96	-0.060	10.550			
Sep.96	-0.050	10.540			
Oct.96	-0.010	10.500			
Nov.96	0.070	10.420			
Dec.96	0.200	10.290			
Jan.97	0.360	10.130			
Feb.97	0.440	10.050			

HS-10-C.XLS

Mar.97	0.660	9.830			
Apr.97	0.710	9.780			
May.97	0.610	9.880			
Jun.97	0.450	10.040			
Jul.97	0.440	10.050			
Aug.97	0.510	9.980			
Sep.97	0.550	9.940			
Oct.97	0.710	9.780			
Nov.97		10.490			
Dec.97	1.110	9.380			
Jan.98	1.210	9.280			
Feb.98	1.390	9.100			
Mar.98	1.240	9.250			
Apr.98	1.350	9.140			
May.98	1.200	9.290			
Jun.98	1.07	9.420			
Jul.98	1.04	9.450			
Aug.98	0.81	9.680			
Sep.98	0.88	9.610			
Oct.98	1.15	9.340			
Nov.98	1.21	9.280			
Dec.98	1.13	9.360			
Jan.99	1.57	8.920			
Feb.99	1.64	8.850			
Mar.99	1.89	8.600			
Apr.99	1.81	8.680			
May.99	1.62	8.870			
Jun.99	1.23	9.260			
Jul.99	1.4	9.090			

HS-11		DN600060AA		GS Elev. = 21.49masl	
Date	WL Elev. (masl)	SWL		Date	EC
Jan.86				6.1.92	1290
Feb.86	2.24	19.47		11.7.93	1284
Mar.86	2.16	19.55		15.1.94	1302
Apr.86	2.09	19.62		13.6.94	1360
May.86	2.02	19.69		6.7.94	1254
Jun.86	1.92	19.79		9.8.94	1390
Jul.86	1.85	19.86		14.9.94	1239
Aug.86	1.76	19.95		5.10.94	1279
Sep.86	1.63	20.08		7.11.94	1255
Oct.86	1.59	20.12		12.12.94	1258
Nov.86	1.48	20.23		8.1.95	1300
Dec.86	1.39	20.32		8.2.95	1318
Jan.87	1.30	20.41		15.2.95	1278
Feb.87	1.24	20.47		8.4.95	1284
Mar.87	1.14	20.57		8.5.95	1300
Apr.87	1.33	20.38		10.6.95	1290
May.87	1.58	20.14		8.7.95	1292
Jun.87	1.60	20.11		8.8.95	1440
Jul.87	1.45	20.26		6.9.95	1316
Aug.87	1.45	20.26		7.10.95	1220
Sep.87	0.94	20.77		6.11.95	1320
Oct.87	0.83	20.88		6.12.95	1324
Nov.87	0.73	20.98		8.1.96	1460
Dec.87	0.65	21.06		6.2.96	1536
Jan.88	0.57	21.14		4.3.96	1440
Feb.88	0.49	21.22		6.4.96	1620
Mar.88	3.55	18.16		8.5.96	1400
Apr.88	3.19	18.52		5.6.96	1370
May.88	2.96	18.75		7.7.96	1360
Jun.88	2.81	18.90		6.8.96	1390
Jul.88	2.58	19.13		10.9.96	1364
Aug.88	2.34	19.37		12.10.96	1340
Sep.88	2.29	19.42		10.11.96	1650
Oct.88	2.05	19.66		14/12/96	1405
Nov.88	1.97	19.74		14/1/97	1440
Dec.88		21.71		18/2/97	1770
Jan.89	1.89	19.82		29/3/97	1420
Feb.89	1.89	19.82		27/4/97	1430
Mar.89	1.93	19.78		17/5/97	1500
Apr.89	1.96	19.75		Jun.98	1484
May.89	1.99	19.72		Dec.98	1390
Jun.89	2.07	19.64		Apr.99	1519
Jul.89	2.08	19.63		May.99	1477
Aug.89	2.10	19.61		Jul.99	1452

Sep.89	2.11	19.60		Aug.99	1450
Oct.89	2.10	19.61		Sep.99	1430
Nov.89	2.11	19.60		Oct.99	1460
Dec.89	2.16	19.55			
Jan.90	2.51	19.20			
Feb.90	2.53	19.18			
Mar.90	3.01	18.70			
Apr.90	3.12	18.59			
May.90	3.11	18.60			
Jun.90	3.07	18.64			
Jul.90	3.03	18.68			
Aug.90	2.99	18.72			
Sep.90	2.88	18.83			
Oct.90	2.82	18.89			
Nov.90	2.77	18.94			
Dec.90	2.76	18.95			
Jan.91	2.69	19.02			
Feb.91	2.75	18.96			
Mar.91	2.76	18.95			
Apr.91	2.78	18.93			
May.91	2.83	18.88			
Jun.91	2.84	18.87			
Jul.91	2.81	18.90			
Aug.91	2.80	18.91			
Sep.91	2.80	18.91			
Oct.91	2.76	18.95			
Nov.91	2.71	19.00			
Dec.91	2.76	18.95			
Jan.92	2.83	18.88			
Feb.92	2.99	18.72			
Mar.92	3.04	18.67			
Apr.92	3.09	18.62			
May.92	3.12	18.59			
Jun.92	3.08	18.63			
Jul.92	3.00	18.71			
Aug.92	2.91	18.80			
Sep.92	2.83	18.88			
Oct.92	2.73	18.98			
Nov.92	2.61	19.10			
Dec.92	2.54	19.17			
Jan.93	2.50	19.21			
Feb.93	2.44	19.27			
Mar.93	2.37	19.34			
Apr.93	2.33	19.38			
May.93	2.29	19.42			
Jun.93	2.20	19.51			
Jul.93	2.12	19.59			

HS-11.XLS

Aug.93	1.92	19.79			
Sep.93	1.92	19.79			
Oct.93	1.84	19.87			
Nov.93	1.75	19.96			
Dec.93	1.66	20.05			
Jan.94	1.66	20.05			
Feb.94	1.76	19.95			
Mar.94	1.75	19.96			
Apr.94	1.80	19.91			
May.94	1.79	19.92			
Jun.94	1.96	19.75			
Jul.94	1.60	20.11			
Aug.94	1.48	20.23			
Sep.94	1.33	20.38			
Oct.94	1.26	20.45			
Nov.94	1.13	20.58			
Dec.94	1	20.71			
Jan.95	0.91	20.80			
Feb.95	0.81	20.90			
Mar.95	0.73	20.98			
Apr.95	0.31	21.40			
May.95	0.59	21.12			
Jun.95	0.5	21.21			
Jul.95	0.42	21.29			
Aug.95	0.65	21.06			
Sep.95	0.57	21.14			
Oct.95	0.42	21.29			
Nov.95	0.34	21.37			
Dec.95	0.31	21.40			
Jan.96	0.67	21.04			
Feb.96	1.07	20.64			
Mar.96	1.18	20.53			
Apr.96	1.45	20.26			
May.96	1.38	20.33			
Jun.96	1.49	20.22			
Jul.96	1.42	20.29			
Aug.96	1.33	20.38			
Sep.96	1.27	20.44			
Oct.96	1.11	20.60			
Nov.96	1.23	20.48			
Dec.96	1.30	20.41			
Jan.97	1.38	20.33			
Feb.97	1.51	20.20			
Mar.97	1.73	19.98			
Apr.97	2.04	19.67			
May.97	2.06	19.65			
Jun.97	2.25	19.46			

Jul.97	2.43	19.28			
Aug.97	2.58	19.13			
Sep.97	2.72	18.99			
Oct.97	3.93	17.78			
Nov.97		21.71			
Dec.97	3.34	18.37			
Jan.98	3.50	18.21			
Feb.98	3.79	17.92			
Mar.98	4.04	17.67			
Apr.98	4.21	17.50			
May.98	4.36	17.35			
Jun.98	4.47	17.24			
Jul.98	4.67	17.04			
Aug.98	4.73	16.98			
Sep.98	4.81	16.90			
Oct.98	4.90	16.81			
Nov.98	5.00	16.71			
Dec.98	5.09	16.62			
Jan.99	5.32	16.39			
Feb.99	5.74	15.97			
Mar.99	5.89	15.82			
Apr.99	5.99	15.72			
May.99	5.97	15.74			
Jun.99	6.04	15.67			
Jul.99	6.04	15.67			
Aug.99	6.07	15.64			
Sep.99	6.11	15.60			
Oct.99	6.03	15.68			

HS-13 DM595676AA

GS Elev. = 63.07 masl

Date	WL Elev. (masl)	swl	Date	EC
Jan.86			02-86	2814
Feb.86	54.43	8.64	05-86	3119
Mar.86	54.42	8.65	06-86	3175
Apr.86	54.45	8.62	07-87	5850
May.86	54.35	8.72	12-87	5800
Jun.86	54.40	8.67	01-91	4023
Jul.86	54.30	8.77	02-91	4410
Aug.86	54.34	8.73	03-91	4430
Sep.86	54.28	8.79	04-91	4430
Oct.86	54.26	8.81	05-91	4400
Nov.86	54.22	8.85	06-91	4340
Dec.86	54.21	8.86	07-91	4320
Jan.87	54.22	8.85	08-91	4260
Feb.87	54.15	8.92	09-91	4260
Mar.87	54.15	8.92	10-91	4230
Apr.87	54.17	8.90	11-91	4060
May.87	54.35	8.72	03-93	4170
Jun.87	54.39	8.68	04-93	4140
Jul.87	54.28	8.79	05-93	4210
Aug.87	54.22	8.85	06-93	4210
Sep.87	54.15	8.92	07-93	4190
Oct.87	54.13	8.94	08-93	4390
Nov.87	54.01	9.06	01-94	4500
Dec.87	54.03	9.04	02-94	4430
Jan.88	53.99	9.08	03-94	4430
Feb.88	54.00	9.07	04-94	4435
Mar.88	55.13	7.94	05-94	4434
Apr.88	55.15	7.92	06-94	4330
May.88	55.24	7.83	07-94	4210
Jun.88	55.10	7.97	08-94	4650
Jul.88	55.23	7.84	09-94	4190
Aug.88	55.23	7.84	10-94	4170
Sep.88	54.80	8.27	11-94	4070
Oct.88	55.14	7.93	12-94	4000
Nov.88	55.06	8.01	01-95	4040
Dec.88	55.03	8.04	02-95	4030
Jan.89	55.01	8.06	03-95	4090
Feb.89	55.05	8.02	04-95	4110
Mar.89	54.92	8.15	05-95	4220
Apr.89	55.05	8.02	06-95	4100
May.89	55.06	8.01	07-95	4150
Jun.89	55.07	8.00	08-95	4300
Jul.89	54.97	8.10	09-95	5140

HS-13.XLS

Aug.89	54.92	8.15	10-95	4120
Sep.89	54.95	8.12	11-95	4200
Oct.89	54.99	8.08	12-95	4210
Nov.89	55.11	7.96	08-96	4160
Dec.89	55.18	7.89	06-96	4220
Jan.90	55.23	7.84	04-96	4100
Feb.90	55.28	7.79	06-96	4590
Mar.90	55.59	7.48	08-96	4120
Apr.90	55.73	7.34	05-96	4080
May.90	55.83	7.24	07-96	4150
Jun.90	56.05	7.02	10-96	4200
Jul.90	56.17	6.90	10-96	4160
Aug.90	56.30	6.77	12-96	4090
Sep.90	56.39	6.68	10-96	4140
Oct.90	56.51	6.56	12-96	4150
Nov.90	56.70	6.37	01-97	4120
Dec.90	56.90	6.17	02-97	4730
Jan.91	56.97	6.10	03-97	4200
Feb.91	57.23	5.84	04-97	4220
Mar.91	57.37	5.70	05-97	4500
Apr.91	57.55	5.52	06-97	3800
May.91	57.58	5.49	01-98	3480
Jun.91	57.71	5.36	02-98	
Jul.91	57.82	5.25	03-98	4440
Aug.91	58.03	5.04	04-98	4400
Sep.91	58.12	4.95	05-98	4000
Oct.91	57.76	5.31	06-98	4240
Nov.91	58.15	4.92	07-98	
Dec.91	58.33	4.74	08-98	
Jan.92	58.37	4.70	09-98	
Feb.92	58.57	4.50	10-98	
Mar.92	58.50	4.57	11-98	
Apr.92	58.53	4.54	12-98	4010
May.92	58.63	4.44	01-99	3860
Jun.92	58.64	4.43	02-99	
Jul.92	58.63	4.44	03-99	
Aug.92	58.61	4.46	04-99	
Sep.92	58.62	4.45	05-99	4070
Oct.92	58.59	4.48	06-99	4000
Nov.92	58.48	4.59	07-99	4130
Dec.92	57.55	5.52	08-99	3980
Jan.93	58.44	4.63	09-99	3930
Feb.93	58.48	4.59	10-99	3940
Mar.93	58.39	4.68		
Apr.93	58.35	4.72		
May.93	58.32	4.75		
Jun.93	58.24	4.83		
Jul.93	58.21	4.86		

HS-13.XLS

Aug.93	58.12	4.95
Sep.93	58.06	5.01
Oct.93	58.01	5.06
Nov.93	57.93	5.14
Dec.93	57.85	5.22
Jan.94	57.84	5.23
Feb.94	57.85	5.22
Mar.94	57.76	5.31
Apr.94	57.75	5.32
May.94	57.68	5.39
Jun.94	57.60	5.47
Jul.94	57.50	5.57
Aug.94	57.44	5.63
Sep.94	57.33	5.74
Oct.94	57.28	5.79
Nov.94	57.12	5.95
Dec.94	57.11	5.96
Jan.95	57.05	6.02
Feb.95	56.96	6.11
Mar.95	56.89	6.18
Apr.95	56.84	6.23
May.95	56.77	6.30
Jun.95	56.70	6.37
Jul.95	56.64	6.43
Aug.95	56.90	6.17
Sep.95	56.88	6.19
Oct.95	56.76	6.31
Nov.95	56.65	6.42
Dec.95	56.58	6.49
Jan.96	56.82	6.25
Feb.96	57.02	6.05
Mar.96	57.06	6.01
Apr.96	57.09	5.98
May.96	57.02	6.05
Jun.96	56.92	6.15
Jul.96	56.87	6.20
Aug.96	56.78	6.29
Sep.96	56.77	6.30
Oct.96	56.67	6.40
Nov.96	56.64	6.43
Dec.96	56.57	6.50
Jan.97	56.55	6.52
Feb.97	56.51	6.56
Mar.97	56.51	6.56
Apr.97		
May.97		
Jun.97	56.53	6.54
Jul.97	56.51	6.56
Aug.97	56.53	6.54
Sep.97	56.55	6.52

HS-13.XLS

Oct.97	56.5	6.57
Nov.97		
Dec.97	56.67	6.40
Jan.98	56.71	6.36
Feb.98	56.8	6.27
Mar.98	56.91	6.16
Apr.98	56.97	6.10
May.98	56.93	6.14
Jun.98	56.95	6.12
Jul.98	57.01	6.06
Aug.98	57.05	6.02
Sep.98	57.04	6.03
Oct.98	57.08	5.99
Nov.98	57.11	5.96
Dec.98	57.18	5.89
Jan.99	57.25	5.82
Feb.99	58.27	4.8
Mar.99	57.62	5.45
Apr.99	57.73	5.34
May.99	57.77	5.3
Jun.99	57.77	5.3
Jul.99	57.82	5.25
Aug.99	57.84	5.23
Sep.99	57.87	5.2
Oct.99	57.86	5.21

OMAN MINING COMPANY LLC.

P.O. Box 758, Muscat, Postal Code 113, Sultanate of Oman

SOHAR OFFICE

Tel. 669420, 850555 ♦ Fax 669409, 669411 ♦ Tlx 8003 ON



شركة عمان للتعدين

ص.ب ٧٥٨، مسقط، الرمز البريدي ١١٣، سلطنة عمان

المكتب صحر

هاتف ٦٦٩٤٢٠، ٨٥٠٥٥٥، فاكس ٦٦٩٤٠٩، ٦٦٩٤١١، تليكس ٨٠٠٣ أون

30 October 1999

Mr. Mohammed bin Hussain bin Kassim
Director General of Minerals
Ministry of Commerce & Industry
Muscat.

Fax No. 7710515

After Compliments,

Sub : Water Analysis equipments

Reference the telephonic conversation you had with the undersigned, we are pleased to furnish herewith the details of equipments used by OMCO for water analysis :

1. Atomic Absorption Spectrophotometer
 - 1a. Varian Techtron Spectra 300 with Microline 393 C Printer
 - 1b. Perkin Elmer 2380
 - 1c. Hollow Cathode Lamps
2. Hach DR/1A Colorimeter
3. 2 Nos. Hach P/N 45900 Bacterial incubator
4. Orion pH/ISE Meter model 720 complete pH and combination chloride electrode.
5. ANKRITE Conductivity meter ACM5T.
6. Millipore Bacterial incubator SI No. 2634.
7. LTE Scientific Magnetic Stirrer with stand S.No. 50496/19.
8. Mettler AE160 Electronic Balance.
9. Whatman Millipore Multiple Filtering Medium with ABMF 108099 Model Vacuum Pump.
10. Elgastat Spectrum Deionizer with 12071/12162 model Cartridges.
11. Gallen Hamp Hotbox Oven
12. B & T Cooled Incubator.
13. Charles Auston Air Pump Dymax 2.
14. Kent EIL 7020 pH Meter.
15. 2 Nos. LTE Hotplates.
16. Fume Hood.
17. ABAC LT200 air compressor.
18. 3 Glass Dissicators
19. Perkin Elmer Hydride Generation Set.

Most of the above equipments are installed since start of our operations in 1983.

As we are fully utilizing the maximum capacity of these equipments for our own use, we do not have any spare capacity for analysing water for outside sources.

Regards,

Ali S. A. Al-Waily
Dy. General Manager

JICA QUESTIONNAIRES

- 7) LIST OF EQUIPMENT AVAILABLE WITH OMCO
- (i) CASELLA SO2 MONITORING UNIT -- ONE No. (Portable Sampler)
 - (ii) GRAVIMETRIC DUST MONITORING UNIT -- ONE No.
 - (iii) FLUE GAS DUST SAMPLING EQUIPMENT
 - (iv) PITOT TUBE FOR PROCESS GAS FLOW MEASUREMENT
 - (v) SIMPLE "U" TUBE MANOMETER
- 8-1) SUPPLEMENTARY SO2 MONITORING DATA AT WADI SUQ AND WADI JIZZI AREA AT 15 KM., 20KM. FROM SMELTER NOT AVAILABLE.
- 8-2) DUST MONITORING DATA AT EXISTING SO2 MONITORING POINTS NOT AVAILABLE.
- 8-3) B-1 DATA ARE AVAILBALE UPTO 10kms RADIUS AROUND THE PLANT AS PER ENVIRONMENTAL REQUIREMENT
- 8-2) NON AVAILABILITY OF SUITABLE EQUIPMENT
- 9.0) STACK GAS

YEAR	FREQUENCY OF MEASUREMENT	GAS FLOW m3/hr.	TEMP	% SO2 %	DUST grms/m3	CHEMICAL COMP OF DUST %
1998	1	186000	250-300	1 - 4	0.22 - 2.18	Cu. 17.4 - 48.26 Fe. 6.31 - 11.12 SiO2. Upto 38.36
1997	2	186000	250-300	1 - 4	0.41 - 1.58	
1996	1	186000	250-300	1 - 4	0.36 - 1.41	
1995	1	186000	250-300	1 - 4	0.46 - 1.51	
1994	2	186000	250-300	1 - 4	0.27 - 1.43	
1993	2	186000	250-300	1 - 4	0.24 - 1.36	

- 9.2) NOT APPLICABLE
- 10.0) CONFIRMED DATAS REGARDING SMELTER/REFINERY EXPANSION NOT PROGRAMME FINALISED YET

Tarmac ⁷

TARMAC ALAWI LLC

are pleased to announce the certification of their
Laboratories Division to ISO 9002 for the

“Supply of material testing services to the
construction, building and related civil Industries”

Tel : 501870
Fax : 590893
e mail : talabs@gto.net.om





WIMPEY ALAWI LLC Laboratories Division Document Reference : PRICE LIST SCHEDULE OF TESTS	Issue:	01
	Revision:	00
	Page:	01
	Date:	18/10/97

1.0 AGGREGATE TESTING			
No.	Description	Rate per Sample	
1.1	Sieve analysis	R.O.	8.000
1.2	Clay, silt and dust (by decantation)	R.O.	4.000
1.3	Flakiness index	R.O.	5.000
1.4	Elongation Index	R.O.	5.000
1.5	Angularity number	R.O.	30.000
1.6	Relative density (specific gravity) and water absorption	R.O.	6.000
1.7	Water absorption	R.O.	3.000
1.8	Clay lumps and friable particles	R.O.	5.000
1.9	Bulk density (rodded)	R.O.	4.000
1.10	Bulk density (loose)	R.O.	4.000
1.11	Voided shell content	R.O.	6.000
1.12	Aggregate crushing value	R.O.	10.000
1.13	Aggregate impact value	R.O.	10.000
1.14	Ten percent fines value	R.O.	10.000
1.15	Los Angeles abrasion value	R.O.	15.000
1.16	Sand equivalent value	R.O.	10.000
1.17	Soundness of aggregate	R.O.	20.000
1.18	Acid soluble sulphate	R.O.	5.000
1.19	Acid soluble chloride	R.O.	5.000
1.20	Water soluble chloride	R.O.	4.000
1.21	Carbonate content	R.O.	10.000
1.22	Organic impurities (qualitative)	R.O.	2.000
1.23	Organic impurities (quantitative)	R.O.	10.000
1.24	Classification of aggregate	R.O.	P.O.A.



WIMPEY ALAWI LLC	Issue:	01
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Document Reference : PRICE LIST	Page:	03
SCHEDULE OF TESTS	Date:	1 8/10/97

3.0 TESTING OF CONCRETE			
No.	Description	Rate per sample	
3.1	Compressive strength and density of concrete cubes	R.O.	1.000
3.2	Compressive strength and density of concrete cylinders	R.O.	2.000
3.3	Indirect tensile strength of concrete cylinder	R.O.	5.000
3.4	Flexural strength of concrete beams	R.O.	10.000
3.5	Compressive strength of precast blocks (set of 10) - ASTM	R.O.	40.000
3.6	Compressive strength of precast blocks (set of 10) - BS	R.O.	15.000
3.7	Water absorption of precast blocks (set of 3)	R.O.	10.000
3.8	Molsture content of precast blocks (set of 3)	R.O.	8.000
3.9	Drying shrinkage of precast blocks	R.O.	150.000
3.10	Density of precast blocks (set of 3)	R.O.	8.000
3.11	Dimensions of precast blocks (set of 10)	R.O.	6.000
3.12	Percentage of cavities in precast blocks	R.O.	6.000
3.13	Compressive strength and density of concrete cores	R.O.	10.000
3.14	Flexural strength of tiles or flags (set of 3)	R.O.	15.000
3.15	Water absorption of tiles or flags (set of 3)	R.O.	10.000
3.16	Impact strength of tiles or flags (per specimen)	R.O.	10.000
3.17	Concrete mix design	R.O.	25.000
3.18	Laboratory trial mix	R.O.	25.000
3.19	Concrete paving blocks (per set of 16)	R.O.	20.000
3.20	Cement content of hardened concrete	R.O.	60.000
3.21	Determination of cement type in hardened concrete	R.O.	30.000
3.22	Depth of carbonation	R.O.	4.000
3.23	Sulpho aluminate content	R.O.	25.000
3.24	Ligno sulphonate content	R.O.	25.000
3.25	Acid soluble chloride content	R.O.	5.000
3.26	Acid soluble sulphate content	R.O.	5.000
3.27	Molsture content	R.O.	2.000
3.28	Concrete core sampling	R.O.	P.O.A.
3.29	Water permeability	R.O.	25.000
3.30	Air content of fresh concrete	R.O.	10.000
3.31	Rebound hammer survey (per test location)	R.O.	15.000
3.32	Delamination survey (per square metre)	R.O.	1.500
3.33	Ultrasonic pulse velocity survey (per measurement)	R.O.	5.000
3.34	Covermeter survey (per square metre)	R.O.	1.000
3.35	Sampling of concrete dust (per 25mm increment)	R.O.	1.500
3.36	Compressive strength on set of 3No. Cubes	R.O.	2.000
3.37	CHLORIDE PERMEABILITY OF CONCRETE CUBE	R.O.	90.000



WIMPEY ALAWI LLC	Issue:	01
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SCHEDULE OF TESTS	Date:	18/10/97

4.0 TESTING OF SOILS			
No.	Description	Rate per sample	
4.1	Moisture Content	R.O.	1.000
4.2	Atterberg limits	R.O.	12.000
4.3	Linear shrinkage	R.O.	6.000
4.4	Dry sieve analysis	R.O.	5.000
4.5	Wet sieve analysis	R.O.	10.000
4.6	Hydrometer analysis	R.O.	15.000
4.7	Moisture/density relationship (2.5kg rammer)	R.O.	20.000
4.8	Moisture/density relationship (4.5kg rammer)	R.O.	22.000
4.9	Moisture/density relationship (vibrating hammer)	R.O.	25.000
4.10	California bearing ratio	R.O.	20.000
4.11	Soaked California bearing ratio	R.O.	30.000
4.12	Total sulphate content	R.O.	5.000
4.13	Total chloride content	R.O.	5.000
4.14	Sulphate content in aqueous extract	R.O.	4.000
4.15	Water soluble chloride content	R.O.	4.000
4.16	pH value	R.O.	2.000
4.17	Organic matter content	R.O.	6.000
4.18	Boron (Total or water soluble)	R.O.	15.000
4.19	Carbonate content	R.O.	14.000
4.2	Cation exchange capacity	R.O.	25.000
4.21	Cation in aqueous extract	R.O.	40.000
4.22	Copper (Total or EDTA extractable)	R.O.	15.000
4.23	Electrical conductivity	R.O.	5.000
4.24	Exchangeable cations	R.O.	45.000
4.25	Gypsum content	R.O.	20.000
4.26	Iron content	R.O.	15.000
4.27	Loss on Ignition	R.O.	10.000
4.28	Manganese (Total or extractable)	R.O.	15.000
4.29	Organic nitrogen	R.O.	25.000
4.30	Phosphorous (Total or available)	R.O.	15.000
4.31	Saturation paste extract	R.O.	75.000
4.32	Total sulphur or sulphide	R.O.	15.000
4.33	Zinc (Total or extractable)	R.O.	15.000
4.34	Full analysis of soil for agricultural purposes	R.O.	135.000



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7.0 TESTING OF WATER		Rate per sample	
No.	Description		
7.1	Alkalinity	R.O.	5.000
7.2	Aluminium content	R.O.	11.000
7.3	Ammonia content	R.O.	14.000
7.4	Barium content	R.O.	11.000
7.5	Bicarbonate	R.O.	5.000
7.6	Boron content	R.O.	11.000
7.7	Bromide content	R.O.	11.000
7.8	Calcium content	R.O.	11.000
7.9	Carbonate	R.O.	5.000
7.10	Chemical oxygen demand	R.O.	15.000
7.11	Chloride	R.O.	5.000
7.12	Free residual chlorine	R.O.	2.000
7.13	Chromium	R.O.	11.000
7.14	Copper	R.O.	11.000
7.15	Dissolved solids	R.O.	5.000
7.16	Electrical conductivity	R.O.	3.000
7.17	Fluoride	R.O.	14.000
7.18	Hardness (Total or permanent)	R.O.	11.000
7.19	Biochemical oxygen demand	R.O.	14.000
7.20	Iodide	R.O.	11.000
7.21	Iron	R.O.	11.000
7.22	Lead	R.O.	12.000
7.23	Magnesium	R.O.	11.000
7.24	Manganese	R.O.	11.000
7.25	Mercury	R.O.	14.000
7.26	Methylene blue stability	R.O.	10.000
7.27	Nickel	R.O.	11.000
7.28	Nitrite	R.O.	11.000
7.29	Oil (solvent extractable)	R.O.	12.000
7.30	Organic matter (qualitative check)	R.O.	5.000
7.31	Oxygen (dissolved)	R.O.	15.000
7.32	pH value	R.O.	1.500
7.33	Permanganate value (4hr)	R.O.	14.000
7.34	Phenol	R.O.	12.000
7.35	Phosphate	R.O.	11.000
7.36	Potassium	R.O.	11.000

Environmental and Building Science services Consultancy, Testing and on-site Monitoring.

Analytical Services

General Chemical analysis covering major areas of concern to the construction and allied industries including cement, aggregates, concrete, waters, metals, admixtures and soils.

Concrete Investigations

Assessment of construction and material defects and failures, including causes and extent of deterioration.

Metallurgy

Mechanical testing of metals and metal products and chemical analysis of metals, deposits and corrosion products. Inspection of epoxy coated rebar and measurement of paint and other surface coatings on different substrates.

Materials Testing

Facilities for the testing of concrete, soils, aggregates, structural components and other building materials.

Environmental

Monitoring of wastes and effluents. Assessment of contaminated soils and waters.

Advisory services

Advise on material selection and problem solving related to the construction industry.

Specialist services

Diamond drilling, Air conditioning system Hygiene.





Environmental Services

Tarmac Laboratories has access to the wide range of environmental testing services offered by the parent group. This includes areas such as air quality monitoring, noise and vibration, environmental impact studies, ecology, atmospheric dispersion monitoring, environmental management, etc.

The local laboratory has facilities to undertake analysis of trade wastes and effluents, contaminated soils and industrial chemicals.

Appropriate testing regimes can be discussed with our experienced chemists in order to optimise clients' requirements.

Typical tests on effluents include.

- Biochemical oxygen demand
- Chemical oxygen demand
- Heavy metals
- Sulphates
- Sulphide
- Oil & Grease
- Phenol
- Detergent
- Mercury
- Arsenic
- Selenium



شركة لالبخش للري والحفريات (ش.م.م)
Lalbuksh Irrigation & Drilling Company (L.L.C.)

LALVOL

P.O. Box : 3146 Ruwi
Postal Code 112
Sultanate of Oman
Tel.: 591721
Fax : (968) 592185
C.R. No. 1/1 2713/8

ص. ب : ٣١٤٦ روي
الرمز البريدي : ١١٢
سلطنة عمان
تليفون : ٥٩١٧٢١
فاكس : ٥٩٢١٨٥ (٩٦٨)
س. ت. رقم : ١/١٢٧١٣/٨

DRI / QTE / 462 / 99

30th Oct'1999

Japan International Co-operation Agency,
Energy & Mining Development Study Division,
Mining & Industrial Development Study Dept.,
Shinjuku Maynds Tower Bldg. 8th Floor,
1-1, Yoyogi, 2 - Chome,
Shibuya - ku,
Tokyo - 151-8558, Japan

Attn. : Mr. Tomoo Hayakawa

After Compliments,

Sub: Drilling for Sohar Environmental Study

We take reference to the discussion undersigned had with you regarding the subject & are pleased to enclose here with the followings:

1. Estimated cost for Pumping Test Well , 8" dia PVC casing to 100mts depth - 2 nos.
2. Estimated cost for Monitoring Well , 4" dia PVC casing to 100mts depth - 2 nos.
3. Estimated cost for Core Drilling , NQ size to 100 mts depth - 2 nos.
4. Scope of work for Pumping Test Well.
5. Scope of work for Monitoring Well.
6. Proposed construction details for Pumping Test Well.
7. Proposed construction details for Monitoring Well.
8. Drilling report format.
9. Pumping test report sample copy.

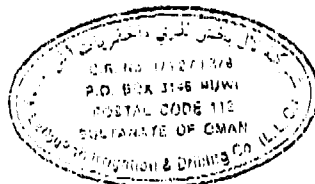
We hope above will meet with your requirements. If you need additional information please do not hesitate to contact us.

Thanking you,

Yours faithfully,
for LALBUKSH IRRIGATION & DRILLING CO. (L.L.C.)

H. P. MISHRA
Manager - Drilling

Encl: As above



cdri\Bec\ qte Sohar\jca

LALBUKSH IRRIGATION & DRILLING CO. (L.L.C.)

P.O. BOX 3146, CODE 112, RUWI,
SULTANATE OF OMAN

Japan International Cooperation Agency
Energy & Mining Development Study Division
Japan

Ref : DRI / QTE / 462 / 99
Date : 30. 10 .99

BILL OF QUANTITIES

Sub : DRILLING WORKS FOR ENVIRONMENTAL STUDY AT SOHAR

Item No.	Description	Unit	Qty	Rate R.O.	Amount R.O.
A	<u>Pumping Test Well 8" dia PVC , 100 mts Deep - 2 No.</u>				
1	Mobilisation and Demobilisation of Water Well Drilling Rig , Equipments & personnel to Sohar area.	LS	-	-	1800.000
2.1	Move & set up Rig at each borehole within 500 mts.	No	1	150.000	150.000
2.2	Move & set up Rig at each borehole beyond 500 mts. up to 10 kilometer.	No	1	450.000	450.000
3	Drill for supply , install and cement in place 13 3/8 " dia M.S. Conductor casing	M	10	70.000	700.000
4	Drill 12 1/4" dia Borehole below base of conductor casing to a depth of 100 mts.	M	190	25.000	4750.000
5	Supply and install 8" dia PVC casing / screen including gravel pack	M	200	16.000	3200.000
6.1	Development of the borewell with compressed air. for a period up to 6 hrs.	No	2	360.000	720.000
6.2	Additional development beyond 6 hrs (if required)	Hr	Rate Only	35.000	-
7	Conduct pumping test (Step test 3 x 100 min & 24 hrs. Constant test)	No	2	600.000	1200.000
8	Collect & analysis water sample for Standard Chemical analysis	No	2	50.000	100.000
9	Construct standard concrete plinth and well head (1 m x 1 m x 0.75 m)	No	2	80.000	160.000
Sub-Total (A)					13,230.000
B	<u>Monitoring Well 4" dia PVC , 100 mts Deep - 2 No.</u>				
1.1	Move & set up Rig at each borehole within 500 mts.	No	1	150.000	150.000
1.2	Move & set up Rig at each borehole beyond 500 mts. up to 10 kilometer.	No	1	450.000	450.000
2	Drill for supply , install and cement in place 9 5/8" dia M.S. Conductor casing	M	10	46.000	460.000

LALBUKSH IRRIGATION & DRILLING CO. (L.L.C.)

P.O. BOX 3146, CODE 112, RUWI,
SULTANATE OF OMAN

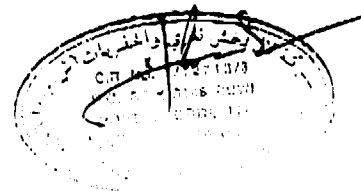
Japan International Cooperation Agency
Energy & Mining Development Study Division
Japan

Ref : DRI / QTE / 462 / 99
Date : 30. 10 .99

BILL OF QUANTITIES

Sub : DRILLING WORKS FOR ENVIRONMENTAL STUDY AT SOHAR

Item No.	Description	Unit	Qty	Rate R.O.	Amount R.O.
3	Drill 8 1/2" dia Borehole below base of conductor casing to a depth of 100 mts.	M	190	18.000	3420.000
4	Supply and install 4" dia PVC casing / screen including gravel pack	M	200	11.000	2200.000
5	Development of the borewell with compressed air. for a period up to 4 hrs.	No	2	240.000	480.000
6	Construct standard concrete plinth and well head (1 m x 1 m x 0.75 m)	No	2	65.000	130.000
Total (B)					7,290.000
C <u>Bore Holes for Core Drilling to 100 mts - 2 nos</u>					
1	Mobilisation and Demobilisation of Core Drilling Rig , Equipments & personnel to Sohar area.	LS	-	-	1200.000
2.1	Move & set up Rig at each borehole within 500 mts.	No	1	100.000	100.000
2.2	Move & set up Rig at each borehole beyond 500 mts. up to 10 kilometer.	No	1	250.000	250.000
3.1	Core Drilling - HQ size (61.1 mm core dia)	M	Rate Only	39.000	-
3.2	Core Drilling - NQ size (50.8 mm core dia)	M	200	30.000	-6000.000
3.3	Core Drilling - BQ size (36.5 mm core dia)	M	Rate Only	23.000	-
Total (C)					-7550.000



LALBUKSH IRRIGATION & DRILLING CO.(LLC)

P.O.Box – 3146, Ruwi, P.Code – 112

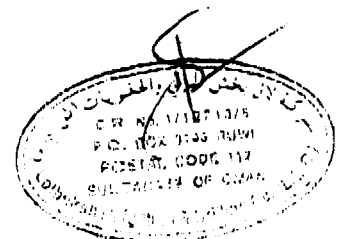
Sultanate of Oman

SCOPE OF WORK FOR PUMPING TEST WELL

Client: Japan International Co-operation Agency

Project: Soar Environmental Study

1. Drilling 17 ½ " Ø to a minimum depth of 5 m or as required. Install and cementing in place 13 3/8 " Ø M.S. Conductor casing.
2. Drilling pilot borehole of 8 ½ "Ø by rotary air foam below base of conductor casing to a depth of 100 m or as required.
3. Measuring yield by blowing compressed air through drill pipe, during drilling every 2 mts. after water strike. During this operation water sample shall be collected for field measurement of electric conductivity.
4. Drill cutting sample will be collected every 1 mts.
Drilling report will be prepared as per the attached report format.
5. If the well yield is found to be satisfactory, the pilot bore hole will be enlarged by reaming to 12 ¼ "Ø .
6. Installation of 8 "Ø PVC casing, screen (2 mm slot), bottom plug etc.
OD - 225 mm, ID - 205 mm.
7. Washed natural wadi gravel round to semi-round size 8 to 10 mm will be placed in the annulus between well casing and borehole.
8. Bore well will be developed by surging and airlift pumping with compressed air for a minimum period of 6 hrs. , so that the borewell water is clear and free from sand.
9. Following development test pump will be installed. A step draw down test consisting of 3 steps of 60 min each at increasing pumping rates will be performed. Based on the step draw down test result, rate of pumping for constant discharge will be decided. Constant discharge test will be conducted for a period of 24 hrs & followed by 6 hrs. recovery test.
10. Pumping test report will be prepared as per the attached sample report.
11. Water sample will be collected at the end of the pumping test for Chemical analysis.
12. The well will be completed including construction of well head concrete plinth and bolted well cover flange as per the attached drawing.



LALBUKSH IRRIGATION & DRILLING CO.(LLC)

P.O.Box – 3146, Ruwi, P.Code – 112

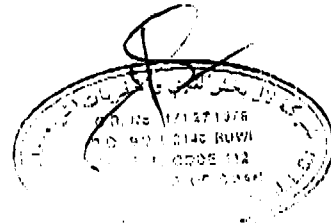
Sultanate of Oman

SCOPE OF WORK FOR MONITORING WELL

Client: Japan International Co-operation Agency

Project: Sohar Environmental Study

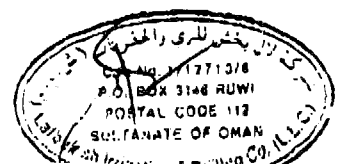
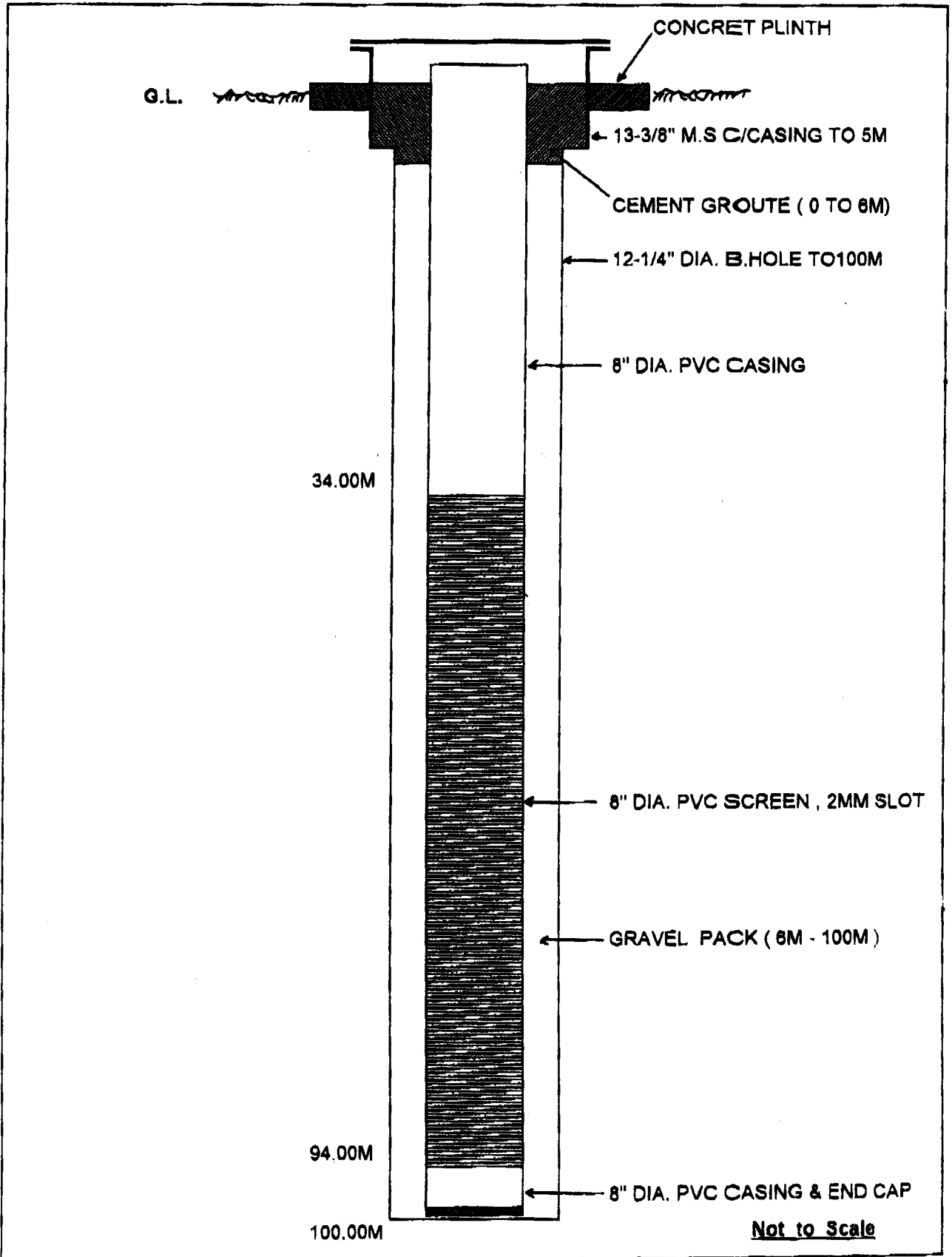
1. Drilling 12 ½ " Ø to a minimum depth of 5 m or as required. Install and cementing in place 9 5/8 " Ø M.S. Conductor casing.
2. Drilling borehole of 8 ½ "Ø by rotary air foam below base of conductor casing to a depth of 100 m or as required.
3. Measuring yield by blowing compressed air through drill pipe, during drilling every 2 mts. after water strike. During this operation water sample shall be collected for field measurement of electric conductivity.
4. Drill cutting sample will be collected every 1 mts.
Drilling report will be prepared as per the attached report format.
5. Installation of 4 "Ø PVC casing, screen (2 mm slot), bottom plug etc.
OD - 114 mm, ID - 103 mm.
5. Washed natural wadi gravel round to semi-round size 8 to 10 mm will be placed in the annulus between well casing and borehole.
7. Bore well will be developed by surging and airlift pumping with compressed air for a minimum period of 4 hrs., so that the borewell water is clear and free from sand.
8. The well will be completed including construction of well head concrete plinth and lockable well cover cap as per the attached drawing.



PROPOSED PUMPING TEST WELL CONSTRUCTION DETAILS

Client : Japan International Co-operation Agency

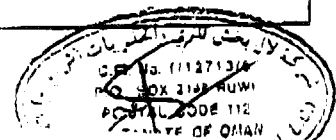
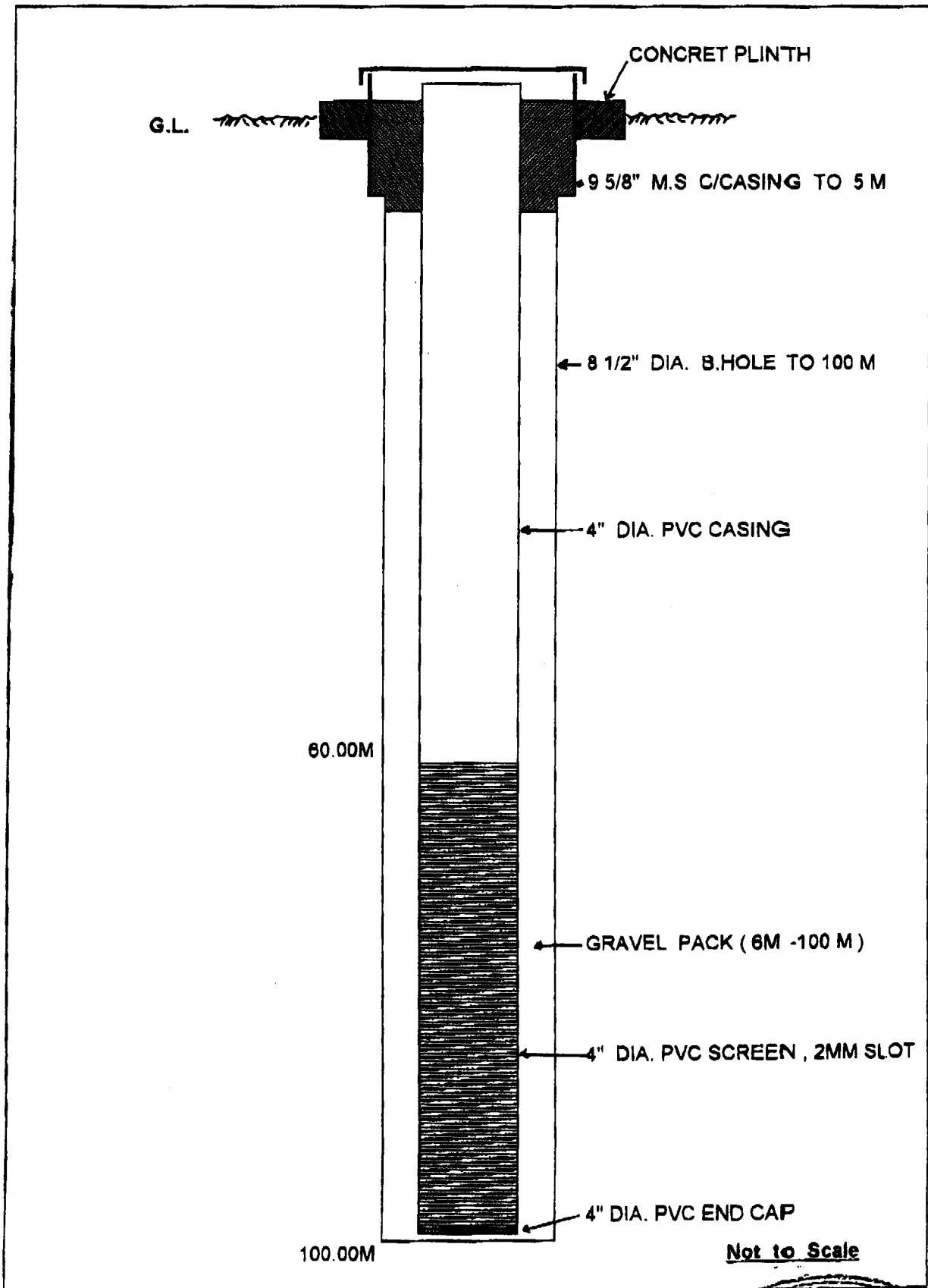
Project : Sohar Environmental Study



PROPOSED MONITORING WELL CONSTRUCTION DETAILS

Client : Japan International Co-operation Agency

Project : Sohar Environmental Study



PUMPING TEST REPORT

PROJECT : New Water Well Drilling at Halban. LOCATION : Halban.
 CLIENT : Sultan's Special Force. BORE HOLE No : WSW # 4
 TYPE OF TEST : Constant Discharge Test DATE : 22.08.1999
 BOREHOLE TYPE : 8" dia Heavy Duty PVC Casing / Screen. WELL DEPTH : 180.0 m bgl.
 PUMP TESTED BY : D.P.Samanta PUMP TYPE : SP 75 - 8 , Grundfos.
 INITIAL WATER LEVEL : 8.44 m below measuring point. PUMP SETTING DEPTH : 60.0 m
 FINAL WATER LEVEL : 16.57 m below measuring point. TIME START : 0715 Hrs (22.08.99)
 MEASURING POINT : 1.10 m above ground level. TIME STOP : 0715 Hrs (23.08.99)
 DISCHARGE : 22.00 LPS SHEET : 1/3
 REMARKS : D.Pipe - 6" dia , Orifice - 4" dia , Q = 4.03/ H

Permit No: T/Z 1424 , Dated : 27.07.99

CLOCK TIME	TIME (Mins.)	WATER LEVEL BELOW M.P. Mtrs.	DRAWDOWN / RECOVERY Mtrs.	DISCHARGE FLOWMETER L. P. S.	PIEZOMETRIC HEIGHT (Inch)	Ec (M / CM)	pH	REMARKS V-Notch(cms) , Etc.
07:15	0	8.44	0.00					
	0.5	13.50	5.06	22.09	30 "	2340		valve adjusted
	1	13.35	4.91					
	1.5	13.36	4.92					
	2	13.39	4.95		30 "			
	2.5	13.41	4.97					
	3	13.45	5.01					
	3.5	13.47	5.03					
	4	13.50	5.06					
	4.5	13.54	5.10					
	5	13.56	5.12	22.06	30 "			
	6	13.59	5.15					
	7	13.62	5.18					
	8	13.64	5.20					
	9	13.67	5.23					valve adjusted
07:25	10	13.71	5.27	22.07	30 "	2360		
	12	13.76	5.32					
	14	13.81	5.37					
	16	13.83	5.39					
	18	13.85	5.41					
	20	13.87	5.43	22.07	30 "			valve adjusted
	25	13.92	5.48					
07:45	30	13.95	5.51	22.06		2440		
	35	13.98	5.54					
	40	14.10	5.66					valve adjusted
	45	14.13	5.69	22.05	30 "	2430		
	50	14.17	5.73					
	55	14.20	5.76					
08:15	60	14.24	5.80	22.06	30 "	2410		
	70	14.30	5.86					
	80	14.35	5.91					
08:45	90	14.40	5.96	22.06	30 "	2410		
	100	14.45	6.01					

LALBUKSH IRRIGATION AND DRILLING Co. L. L. C.

BORE HOLE No : WSW # 4

SHEET : 2/3

S.W.L # : 8.44 m below measuring point.

CLOCK TIME	TIME (Mins.)	WATER LEVEL BELOW M.P. Mtrs.	DRAWDOWN/ RECOVERY Mtrs.	DISCHARGE FLOWMETER L. P. S.	PIEZOMETRIC HEIGHT (Inch)	Ec (M/CM)	pH	REMARKS
09:15	120	14.58	6.14	22.06	30 "	2410		valve adjusted
	140	14.65	6.21					
	160	14.74	6.30					valve adjusted
10:15	180	14.82	6.38	22.05	30 "	2420		
	200	14.87	6.43					
	220	14.93	6.49					
11:15	240	15.02	6.58	22.06	30 "	2400		
	260	15.08	6.64					
	280	15.16	6.72					
12:15	300	15.20	6.76	22.06	30 "	2360		
	330	15.28	6.84					
13:15	360	15.35	6.91	22.06		2330		
	390	15.41	6.97					
14:15	420	15.46	7.02	22.06	30 "	2310		
	450	15.54	7.10					
15:15	480	15.58	7.14	22.05		2320		
	510	15.64	7.20					
16:15	540	15.70	7.26	22.06	30 "	2310		
	570	15.76	7.32					
17:15	600	15.81	7.37	22.04		2310		
	630	15.88	7.44					valve adjusted
18:15	660	15.92	7.48	22.05	30 "	2300		
	690	15.95	7.51					
19:15	720	15.99	7.55	22.05	30 "	2310		
	750	16.03	7.59					
20:15	780	16.06	7.62	22.05	30 "	2350		
	810	16.10	7.66					
21:15	840	16.13	7.69	22.05	30 "	2320		
	870	16.18	7.74					valve adjusted
22:15	900	16.20	7.76	22.05	30 "	2360		
	930	16.22	7.78					
23:15	960	16.26	7.82	22.05	30 "	2410		valve adjusted
	990	16.27	7.83					
00:15	1020	16.29	7.85			2430		
	1050	16.31	7.87	22.06	30 "			
01:15	1080	16.32	7.88			2390		
	1110	16.34	7.90	22.06	30 "			
02:15	1140	16.36	7.92			2420		valve adjusted
	1170	16.40	7.96	22.05	30 "			
03:15	1200	16.41	7.97			2450		
	1230	16.43	7.99	22.06	30 "			
04:15	1260	16.46	8.02			2420		
	1290	16.49	8.05	22.06	30 "			
05:15	1320	16.51	8.07			2400		
	1350	16.52	8.08	22.05	30 "			
06:15	1380	16.56	8.12			2370		
	1410	16.56	8.12	22.05	30 "			
07:15	1440	16.57	8.13			2410		

RECOVERY TEST DATA

PROJECT : New Water Well Drilling at Halban. DATE : 23.08.99
 CLIENT : Sultan's Special Force.
 WELL NO : WSW # 4
 TYPE OF TEST : Constant Discharge Test
 TIME START : 0715 Hrs (23.08.99) TIME STOP : 1215 hrs
 S.W. L # : 8.44 m below measuring point
 REMARKS : M.P.# 1.10 m above ground level SHEET : 3/3

Permit No: T/Z 1424, Dated : 27.07.99

ELAPSED TIME (MINS.)	DYNAMIC RECOVERY MTRS.	RESIDUAL RECOVERY MTRS.	ELAPSED TIME (MINS.)	DYNAMIC RECOVERY MTRS.	RESIDUAL RECOVERY MTRS.
0	16.57	8.13	120	10.68	2.24
0.5	11.55	3.11	140	10.65	2.21
1	11.40	2.96	160	10.61	2.17
1.5	11.35	2.91	180	10.57	2.13
2	11.30	2.86	200	10.53	2.09
2.5	11.29	2.85	220	10.49	2.05
3	11.29	2.85	240	10.46	2.02
3.5	11.29	2.85	260	10.41	1.97
4	11.29	2.85	280	10.35	1.91
4.5	11.29	2.85	300	10.30	1.86
5	11.27	2.83	330	10.25	1.81
6	11.26	2.82	360	10.19	1.75
7	11.25	2.81	390		
8	11.24	2.80	420		
9	11.23	2.79	450		
10	11.22	2.78	480		
12	11.20	2.76	510		
14	11.19	2.75	540		
16	11.18	2.74	570		
18	11.15	2.71	600		
20	11.13	2.69			
25	11.12	2.68			
30	11.08	2.64			
35	11.05	2.61			
40	11.02	2.58			
45	11.00	2.56			
50	10.98	2.54			
55	10.94	2.50			
60	10.92	2.48			
70	10.88	2.44			
80	10.83	2.39			
90	10.77	2.33			
100	10.74	2.30			

PUMPING TEST REPORT

PROJECT : New Water Well Drilling at Halban. **LOCATION** : Halban.
CLIENT : Sultan's Special Force. **BORE HOLE No** : WSW # 4
TYPE OF TEST : Step Drawdown Test **DATE** : 20.08.1999
BOREHOLE TYPE : 8" dia Heavy Duty PVC Casing / Screen. **WELL DEPTH** : 180.0 m bgl.
PUMP TESTED BY : D.P.Samanta **PUMP TYPE** : SP 75 - 8 , Grundfos.
INITIAL WATER LEVEL : 7.80 m below measuring point. **PUMP SETTING DEPTH** : 60.0 m
FINAL WATER LEVEL : 9.32 m below measuring point. **TIME START** : 0700 Hrs
MEASURING POINT : 1.10 m above ground level. **TIME STOP** : 0800 Hrs
DISCHARGE : 10.00 Lps **SHEET** : 1 / 6 (Step - 1)
REMARKS : D.Pipe - 6" dia , Orifice - 4 " dia , Q = 4.03 / H

Permit No: T/Z 1424 , Dated : 27.07.99

CLOCK TIME	TIME (Mins.)	WATER LEVEL BELOW M.P. Mtrs.	DRAWDOWN / RECOVERY Mtrs.	DISCHARGE FLOWMETER L . P . S .	PIEZOMETRIC HEIGHT (Inch)	Ec (M / CM)	pH	REMARKS
07:00	0	7.80	0.00					
	0.5	12.92	5.12	9.89				
	1	9.10	1.30					
	1.5	9.07	1.27		6"			
	2	9.23	1.43					
	2.5	9.29	1.49					
	3	9.13	1.33					
	3.5	9.18	1.38					
	4	9.20	1.40					
	4.5	9.20	1.40					
07:05	5	9.19	1.39	9.89	6"	2150		
	6	9.19	1.39					
	7	9.18	1.38					
	8	9.19	1.39					
	9	9.19	1.39					
07:10	10	9.19	1.39	9.89	6"	2180		
	12	9.20	1.40					
	14	9.20	1.40					
	16	9.21	1.41					
	18	9.20	1.40					
07:20	20	9.21	1.41	9.89	6"			
	25	9.22	1.42					
07:30	30	9.25	1.45	9.89	6"	2200		
	35	9.25	1.45					
	40	9.28	1.48					
07:45	45	9.28	1.48	9.89	6"	2200		
	50	9.29	1.49					
	55	9.30	1.50					
08:00	60	9.32	1.52		6"	2220		
	70							
	80							
	90							
	100							

PUMPING TEST REPORT

PROJECT : New Water Well Drilling at Halban. LOCATION : Halban.
 CLIENT : Sultan's Special Force. BORE HOLE No : WSW # 4
 TYPE OF TEST : Step Drawdown Test DATE : 20.08.1999
 BOREHOLE TYPE : 8" dia Heavy Duty PVC Casing / Screen. WELL DEPTH : 180.0 m bgl.
 PUMP TESTED BY : D.P.Samanta PUMP TYPE : SP 75 - 8 , Grundfos.
 INITIAL WATER LEVEL : 7.80 m below measuring point. PUMP SETTING DEPTH : 60.0 m
 FINAL WATER LEVEL : 10.60 m below measuring point. TIME START : 0800 Hrs
 MEASURING POINT : 1.10 m above ground level TIME STOP : 0900 Hrs
 DISCHARGE : 14.00 Lps SHEET : 2 / 6 (Step - 2)
 REMARKS : D.Pipe - 6" dia , Orifice - 4 " dia , Q = 4.03./ H

Permit No: T/Z 1424 , Dated : 27.07.99

CLOCK TIME	TIME (Mins.)	WATER LEVEL BELOW M.P. Mtrs.	DRAWDOWN / RECOVERY Mtrs.	DISCHARGE FLOWMETER L. P. S.	PIEZOMETRIC HEIGHT (Inch)	Ec (M / CM)	pH	REMARKS
08:00	0	9.32	1.52					
	0.5	10.25	2.45	14.01				
	1	10.30	2.50					
	1.5	10.31	2.51		12 "			
	2	10.32	2.52					
	2.5	10.32	2.52					
	3	10.34	2.54					
	3.5	10.35	2.55					
	4	10.45	2.65					valve adjusted
	4.5	10.45	2.65					
08:05	5	10.35	2.55	14.00	12 "	2200		
	6	10.35	2.55					
	7	10.36	2.56					
	8	10.36	2.56					
	9	10.36	2.56					
08:10	10	10.37	2.57	13.97	12 "	2220		valve adjusted
	12	10.39	2.59					
	14	10.48	2.68					
	16	10.48	2.68					
	18	10.49	2.69					
08:20	20	10.49	2.69	14.00	12 "			
	25	10.50	2.70					
08:30	30	10.52	2.72	14.00	12 "	2230		
	35	10.55	2.75					
	40	10.58	2.78					
08:45	45	10.60	2.80	13.95	12 "	2250		
	50	10.60	2.80					
	55	10.60	2.80					
09:00	60	10.60	2.80		12 "	2280		
	70							
	80							
	90							
	100							

PUMPING TEST REPORT

PROJECT : New Water Well Drilling at Halban. LOCATION : Halban.
 CLIENT : Sultan's Special Force. BORE HOLE No : WSW # 4
 TYPE OF TEST : Step Drawdown Test DATE : 20.08.1999
 BOREHOLE TYPE : 8" dia Heavy Duty PVC Casing / Screen. WELL DEPTH : 180.0 m bgl.
 PUMP TESTED BY : D.P.Sagnanta PUMP TYPE : SP 75 - 8 , Grundfos.
 INITIAL WATER LEVEL : 7.80 m below measuring point. PUMP SETTING DEPTH : 60.0 m
 FINAL WATER LEVEL : 12.23 m below measuring point. TIME START : 0900 Hrs
 MEASURING POINT : 1.10 m above ground level TIME STOP : 1000 Hrs
 DISCHARGE : 18.00 Lps SHEET : 3 / 6 (Step - 3)
 REMARKS : D.Pipe - 6" dia , Orifice - 4" dia , Q = 4.03./H

Permit No: T/Z 1424 , Dated : 27.07.99

CLOCK TIME	TIME (Mins.)	WATER LEVEL BELOW M.P. Mtrs.	DRAWDOWN / RECOVERY Mtrs.	DISCHARGE FLOWMETER L.P.S.	PIEZOMETRIC HEIGHT (Inch)	Ec (M / CM)	pH	REMARKS
09:00	0	10.60	2.80					
	0.5	11.84	4.04	18.03				
	1	11.88	4.08					
	1.5	11.89	4.09		20"			
	2	11.90	4.10					
	2.5	11.91	4.11					
	3	11.91	4.11					
	3.5	11.91	4.11					
	4	11.91	4.11					
	4.5	11.91	4.11					
09:05	5	11.92	4.12	17.97	20"	2280		
	6	12.02	4.22					valve adjusted
	7	12.02	4.22					
	8	12.04	4.24					
	9	12.04	4.24					
09:10	10	12.05	4.25	18.04	20"	2270		
	12	12.05	4.25					
	14	12.06	4.26					
	16	12.06	4.26					
	18	12.07	4.27					
09:20	20	12.08	4.28	18.04	20"			
	25	12.08	4.28					
09:30	30	12.08	4.28	18.04	20"	2240		
	35	12.09	4.29					
	40	12.09	4.29					
09:45	45	12.15	4.35	18.06	20"	2250		valve adjusted
	50	12.15	4.35					
	55	12.20	4.40					
10:00	60	12.23	4.43		20"	2270		
	70							
	80							
	90							
	100							

PUMPING TEST REPORT

PROJECT : New Water Well Drilling at Halban. LOCATION : Halban.
 CLIENT : Sultan's Special Force. BORE HOLE No : WSW # 4
 TYPE OF TEST : Step Drawdown Test DATE : 20.08.1999
 BOREHOLE TYPE : 8" dia Heavy Duty PVC Casing / Screen. WELL DEPTH : 180.0 m bgl.
 PUMP TESTED BY : D.P.Samanta PUMP TYPE : SP 75 - 8, Grundfos.
 INITIAL WATER LEVEL : 7.80 m below measuring point. PUMP SETTING DEPTH : 60.0 m
 FINAL WATER LEVEL : 14.25 m below measuring point. TIME START : 1000 Hrs
 MEASURING POINT : 1.10 m above ground level. TIME STOP : 1100 Hrs
 DISCHARGE : 22.00 Lps SHEET : 4 / 6 (Step - 4)
 REMARKS : D.Pipe - 6" dia , Orifice - 4" dia , Q = 4.03 / H

Permit No: T/Z 1424, Dated : 27.07.99

CLOCK TIME	TIME (Mins.)	WATER LEVEL BELOW M.P. Mtrs.	DRAWDOWN / RECOVERY Mtrs.	DISCHARGE FLOWMETER L. P. S.	PIEZOMETRIC HEIGHT (Inch)	Ec (M / CM)	pH	REMARKS
10:00	0	12.23	4.43					
	0.5	13.75	5.95	22.09				
	1	13.80	6.00					
	1.5	13.82	6.02		30"			
	2	13.85	6.05					
	2.5	13.86	6.06					
	3	13.87	6.07					
	3.5	13.90	6.10					
	4	13.91	6.11					
	4.5	13.92	6.12					
10:05	5	13.93	6.13	22.09	30"	2270		
	6	13.93	6.13					
	7	13.95	6.15					
	8	13.95	6.15					
	9	13.96	6.16					
10:10	10	13.97	6.17	22.10	30"	2270		
	12	13.99	6.19					
	14	14.01	6.21					
	16	14.03	6.23					
	18	14.05	6.25					
10:20	20	14.06	6.26	22.10	30"			
	25	14.07	6.27					
10:30	30	14.10	6.30	22.10	30"	2260		
	35	14.13	6.33					
	40	14.14	6.34					
10:45	45	14.15	6.35	22.10	30"	2260		
	50	14.20	6.40					
	55	14.25	6.45					
11:00	60	14.25	6.45		30"	2260		
	70							
	80							
	90							
	100							

PUMPING TEST REPORT

PROJECT : New Water Well Drilling at Halban. LOCATION : Halban.
 CLIENT : Sultan's Special Force. BORE HOLE No : WSW # 4
 TYPE OF TEST : Step Drawdown Test DATE : 20.08.1999
 BOREHOLE TYPE : 8" dia Heavy Duty PVC Casing / Screen. WELL DEPTH : 180.0 m bgl.
 PUMP TESTED BY : D.P.Samanta PUMP TYPE : SP 75 - 8 , Grundfos.
 INITIAL WATER LEVEL : 7.80 m below measuring point. PUMP SETTING DEPTH : 60.0 m
 FINAL WATER LEVEL : 16.25 m below measuring point. TIME START : 1100 Hrs
 MEASURING POINT : 1.10 m above ground level TIME STOP : 1200 Hrs
 DISCHARGE : 25.70 Lps (Full Valve Open) SHEET : 5 / 6 (Step - 5)
 REMARKS : D.Pipe - 6" dia , Orifice - 4 " dia , Q = 4.03/H

Permit No: T/Z 1424 , Dated : 27.07.99

CLOCK TIME	TIME (Mins.)	WATER LEVEL BELOW M.P. Mtrs.	DRAWDOWN / RECOVERY Mtrs.	DISCHARGE FLOWMETER L.P.S.	PIEZOMETRIC HEIGHT (Inch)	Ec (M / CM)	pH	REMARKS
11:00	0	14.25	6.45					VALVE
	0.5	15.60	7.80	25.75				FULL OPEN
	1	15.75	7.95					
	1.5	15.80	8.00		40.5 "			
	2	15.82	8.02					
	2.5	15.86	8.06					
	3	15.87	8.07					
	3.5	15.88	8.08					
	4	15.90	8.10					
	4.5	15.91	8.11					
11:05	5	15.91	8.11	25.73	40.5 "	2300		
	6	15.93	8.13					
	7	15.94	8.14					
	8	15.95	8.15					
	9	15.96	8.16					
11:10	10	15.97	8.17	25.73	40.5 "	2290		
	12	15.98	8.18					
	14	16.00	8.20	25.73				
	16	16.02	8.22					
	18	16.04	8.24					
11:20	20	16.05	8.25	25.71	40.5 "			
	25	16.09	8.29					
11:30	30	16.11	8.31	25.72	40.5 "	2280		
	35	16.15	8.35					
	40	16.17	8.37					
11:45	45	16.20	8.40	25.73	40.5 "	2280		
	50	16.22	8.42					
	55	16.23	8.43					
12:00	60	16.25	8.45		40.5 "	2390		
	70							
	80							
	90							
	100							

RECOVERY TEST DATA

PROJECT : New Water Well Drilling at Halban. DATE : 20.08.1999
 CLIENT : Sultan's Special Force.
 WELL NO : WSW # 4
 TYPE OF TEST : Step Drawdown Test
 TIME START : 1200 Hrs TIME STOP : 1210 hrs
 S.W. L # : 7.80 m below measuring point.
 REMARKS : M.P.# 1.10 m above ground level SHEET : 6/6

Permit No: T/Z 1424 , Dated : 27.07.99

ELAPSED TIME (MINS.)	DYNAMIC RECOVERY MTRS.	RESIDUAL RECOVERY MTRS.	ELAPSED TIME (MINS.)	DYNAMIC RECOVERY MTRS.	RESIDUAL RECOVERY MTRS.
0	16.25	8.45	120		
0.5	9.59	1.79	140		
1	9.40	1.60	160		
1.5	9.40	1.60	180		
2	9.37	1.57	200		
2.5	9.35	1.55	220		
3	9.34	1.54	240		
3.5	9.32	1.52	260		
4	9.32	1.52	280		
4.5	9.31	1.51	300		
5	9.30	1.50	330		
6	9.29	1.49	360		
7	9.27	1.47	390		
8	9.27	1.47	420		
9	9.25	1.45	450		
10	9.24	1.44	480		
12			510		
14			540		
16			570		
18			600		
20					
25					
30					
35					
40					
45					
50					
55					
60					
70					
80					
90					
100					