GEOLOGICAL PROJECT

FOR THE DEVELOPMENT WELL

AL MAHR-6

CONTENTS

Basic Well Data

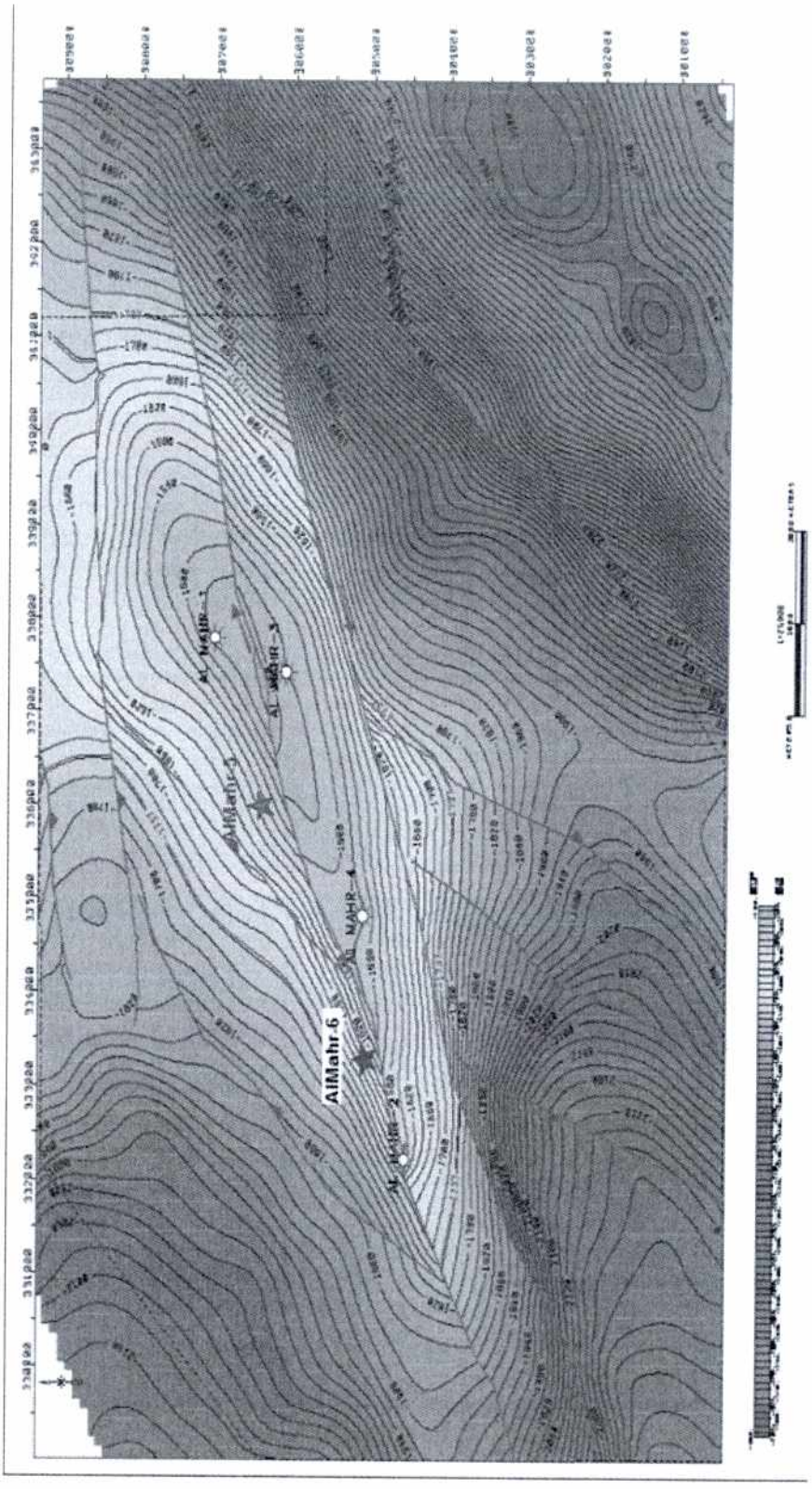
Name of location / well	:	AL MAHR-6
Type of well	:	Development
Co-ordinates	:	X = 333 621.62 (E) Y = 305125 (N)
Elevation	:	GL = 702 m
		KB = 6 m
Objectives	:	Primary: Kurrachine Dolomite – C2
Trap type	:	Faulted anticline
Planned Total Depth	:	2468 m RKB

1) Introduction

The Al Mahr field is discovered in 2002 by exploration well Al Mahr-1, on the northwestern part of the Hayan Block in central Syria (approximately 60 km northwest from town Palmyra).
Reservoir is formed inside Triassic Kurrachine Dolomite formation (C2 unit). It is retrograde gas bearing reservoir. In February 2004 appraisal well Al Mahr-2 was drilled. According to Development Plan for Al Mahr field (issued in March, 2006), two development wells have been proposed to fulfill the planned production rates. Preliminary, both of them are placed at the eastern part of field toward structural high and closer to Jihar fault zone where better reservoir quality is expected according to seismic attribute analysis. The development well Al Mahr-3 was drilled in the last quarter of 2008. Although it was placed approx. 1 km from well Al Mahr-1, the targeted reservoir (C2) was drilled 151 m deeper than it was forecasted from the latest seismic interpretation. The development well Al Mahr-4 was drilled in the first quarter of 2009. Although it was placed approx. 1 km from well Al Mahr-1, the targeted reservoir (C2) was drilled 151 m deeper than it was forecasted from the latest seismic interpretation.
Assumption from Development Plan about better reservoir characteristics in the zone between Jihar fault and northern "en echelon" fault, that was derived then from seismic attribute analysis, missed to be proved because testing of primary target (C2) on Al Mahr-3 has been postponed to be done prior gas & condensate production start-up. Thus, the assumption regard to reservoir quality continues.
According to hard data from previous HPC wells, revision of 3D seismic and surface geological map (1:50 000, issued by Syrian Geological Establishment for Petroleum and Mineral Resources), a sequence of deposits from Upper Cretaceous Shiranish formation down to targeted Middle Triassic Kurrachine Dolomite formation C2 unit should be expected.
Problems with mud losses are highly possible from lower Soukhne fm. On wells Al Mahr-1 and Al Mahr-2, total mud losses were not stopped and long section of blind drilling down to Butmah fm was done that had an impact on cost and time schedule (additional water supply, tool stuck and tool fishing, side tracking). On Al Mahr-3, total mud losses in Soukhne Rmah Chert Mb were promptly treated with several cement plugs and drilling through Judea was continued with mud circulation (additional partial mud losses were controlled with LCM pills).
Therefore, it is strongly recommended to apply the same strategy when total mud losses occur. Further, water supply has to be organized to avoid a lack of water (large water pit of 10000 m3 is proposed).

The goal of development well Al Mahr-6 is:

- **To reach and drill through Kurrachine Dolomite C2 reservoir, to test and complete it for production**
- **Planned TD is 2468 m at the bottom part of Kurrachine Dolomite C2 unit.**


AlMahr-6

2) Geology

2.1 Structure/Trap

Al Mahr structure is situated at the northern flank of Jihar fault system. It is right southwest-northeast strike slip representing a branch of Dead Sea left strike slip (major fault system on Levant). Al Mahr structure is formed as result of compressional and transpressional tectonics.
Its orientation follows Jihar fault strike with slight rotation of the eastern part caused by latest synthetic fault (strike Tyas - Ash Shaer) that cut the structure in the middle part (visible as wadi area on surface).
Al Mahr structure represents a positive "flower" structure bounded with main Jihar fault (south edge) and "en echelon" (normal) faults forming an expressive anticline with steep flanks.
Al Mahr is massive type of reservoir. Trap type is classified as faulted anticline. Kurrachine Anhydrite formation deposits represent a good reservoir seal.

2.2 Anhydrite formation deposits represent a good reservoir seal.

Stratigraphical Prognosis

DEPTH (m)	FORMATION	AGE	FORMATION TYPE LITHOLOGY
SPUD	Kermav	Paleocene	Clayey Limeston, Limeston, Anhydrite, Gypsum
169	SHIRANISH	U. Camp. - Maastrichtian	Limestone (mudstone wackestone) interbedded with claystone and marl.
349	SOUKHNE ARAK MARL	U. Santonian -L. Campanian	Sandy marl, limestone, phosphatic/glauconitic intercalations
729	JUDEA	Turonian - U. Cenomanian	Dolomites and limestones, karstified, stratified
880	HAYANE	Cenomanian - U. Albian	Dolomites and limestones, karstified, stratified
1138	RUTBAH	L. Cretaceous	Sandstones, micro conglomerate.
1165	HARA MOUN	L. - M. Jurassic	Limestones, dolomites, karstified
1584	BUTMAH	U. Triassic, Carnian	Dolomites interbedded with anhydrite, limestone and minor claystone
1965	KURRACHINE ANHYDRITE	Ladinian	Interbedded salt, anhydrite, claystone, dolomite and limestone. Salt is of variable thickness.
2328	C2 Reservoir	Ladinian	Dolomite, limestone, claystone, anhydrite intercalations

Proposed total depth of 2468 m

KERMAV Formation , Paleocene.
(Spud - 169 m, 169 m)

The Formation consists entirely of marl and limestone.

CLAYEY LIMESTONE, light brown, argillaceous, medium hard to hard.

LIMESTONE, brownish gray to brown, occasionally gray, argillaceous, medium hard to hard, microcrystallinic to crystallinic, no visible porosity.

*Anhydrite, in traces, transparent, white to milky white.

*Gypsum, in traces, transparent, vitreous.

*These traces are most probably the result of the surface water penetration and crystallization into the near surface fractures.

Depositional environment of this formation was deep open shelf to upper bathyal.

SHIRANISH Formation (Upper Campanian Maastrichtian)
(169-349 m , 180 m)

Limestone (mudstone and wackestone), occasionally interbedded with minor claystone and marl. Moderately to very argillaceous, slightly glauconitic and pyritic and occasionally chalky. Rare ferriginous, siliceous and phosphate concretions.

Depositional environment: Offshore, deep outer shelf to upper bathyal.

SOUKHNE Group
Arak marl (Upper SantonianLower. Campanian) (349- 375 m, 26 m)
Rmah chert (ConiacianLower Santonian) (375 – 729 m, 354 m)
Limestones, dolomitic limestones, marls, clays, cherts, phosphatic and some sandy and conglomeratic beds.

In the base of the unit are sandy marly and carbonate deposits with thin beds of chert or thin beds of phosphatic marl or glauconitic marl. It is possible to separate the **lower part Rmah chert** which ends at the top of cherty layers and the **upper part Arak marl** which is empty of chert layers except at the top where a few thin chert and phosphatic or glauconitic beds are present.

Depositional environment: Deeper outer shelf.

JUDEA Formation (Turonian Upper Cenomanian)
(729 - 880 m, 151 m)

This unit is composed of three distinguished sedimentary zones.

The base of this unit consists of fossiliferous marly horizon (micrite to clayely biomicrite) which overlies deposits of the Hayane Formation and dark grey massive dolomite. These dolomites are dolomicrosparite to fine dolosparite in the lower part, because of crystallization dolomites become coarser towards the top.

Middle part of the unit is composed of dolomitic rocks with some calcareous or marly intercalations. Stratified dolomitic layers are fine to cryptocrystallized and rarely medium crystallized. Grey dolomitic interval, in the upper part is generally characterised by fine to mediumcrystalized dolosparite. In places limestones with rudists are common.

The upper part of the unit generally consists of limestones and dolomites with chert nodules. Deposits are generally stratified and the layers are decimetric and occassionally metric in thickness.

Depositional environment: Very, shallow marginal marine, inner shelf.

HAYANE Formation (CenomanianUpper Albian)
(880 - 1138 m, 258 m)

Dolomites forms a prominent stratified carbonate section, between two soft horizons. At the base are sandstones of the Rutbah Formation and on the top are marls of the Judea Formation. Dolomites are locally interlayered with marly dolomites or anhydrite horizonts.
The top of the unit is specially distinguished by a typical hard ground surface which is locally overlain with red and purple ferruginous nodules which occasionaly appear as a broken ferruginous skin.
Depositional environment: Very, shallow marginal marine, inner shelf.

RUTBAH Formation (Lower CretaceousNeocomian)
(1138 -1165 m, 27 m)

Rutbah Formation marks the base of the Cretaceous and is unconformable with the underlying Jurassic. The unit is mainly composed of red, purple or yellow ferruginous sandstone, locally intercalated with carbonates and marly horizons. Basalt and basaltic tuff are locally present in the backbone of the unit or at its base. The thickness of this unit is limited and variable.
Depositional environment: Fluviodeltaic to marginal shallow marine.

HARA MOUN Formation (Early Middle Jurassic)

(1165 – 1584 m, 419 m)

The Jurassic deposits overlie the Triassic and generally are composed of carbonate rocks; limestones (dominant are biomicritic and micritic limestones, mudstone and wackestone, rarely packstone) and dolomites (dolomicrite to coarsecrystallized dolosparite, sometimes stromatolitic, birdeye and mud cracks) with marly horizons in places anhydrites and sandstone (specially in the lower part).,.
Depositional environment: Shallow marginal marine.

BUTMAH Formation (Upper Triassic, Carnian)

(1584 -1965 m, 381 m)

Upper Triassic Butmah formation consists of carbonates (predominantly dolomite) and shale/claystone intercalations.
Dolomite: light brown to brown, hard, firm, microcrystalline, locally sucrose, argillaceous, poor intercrystalline porosity.
Limestone: light gray to gray, hard, sucrosic, fine crystalline to microcrystalline, rare fossils, occasionally **chalky**, light gray to white, soft, friable, no visible porosity.
Shale: dark gray, hard, platy, occasionally **claystone**, friable, massive, slightly dolomitic.
At bottom **anhydrite**, white to off white, cream, soft, amorphous.
Depositional environment: Restricted shallow marine.

KURRACHINE ANHYDRITE Formation (Ladinian)
(1965 - 2328 m, 363 m)

Kurrachine Anhydrite Formation shows significant thickening. It consists of anhydrite, salt and shale/claystone layers (dolomite is present in the upper part above main salt body and at very bottom, more dolomitic shale). Main salt body should be expected at 1601 m.
Salt: light gray to dark gray, occasionally rare grains reddish brown, abundant transparent, euhedral crystals, moderately hard, in places soft, amorphous, soluble.

Anhydrite: white to off white, rarely pale gray to light brown, friable, mostly soft, amorphous, in places firm microcrystalline to fine crystalline particles, locally transparent euhedral crystals.
Claystone: light to dark gray, soft, friable, fissile to massive, slightly dolomitic.
Shale: dark gray, occasionally light brown to dark brown, soft to medium hard, occasionally friable, locally laminated, slightly dolomitic.
Dolomite: light gray to brown, occasionally dark brown, firm, hard, microcrystalline, slightly to very argillaceous, grading to dolomitic shale, poor intercrystalline porosity, moderate fracture porosity (upper part) and light brown to dark brown, medium hard, microcrystalline to crystalline, occasionally sucrose, poor intercrystalline porosity (bottom part).
Depositional environment: Restricted shallow marine – supratidal salina.

KURRACHINE DOLOMITE – C2 Formation (Middle Triassic Ladinian Anisian) (2328 - 2468 m, 140 m)

C2 reservoir is uniformly, around 260 m thick series of rhythmical intercalation of dolomitized limestone, fine crystalline, partly anhydritized dolomite and claystone/shale.
Limestone: white, light gray to dark gray, beige, dark brown, crystalline to microcrystalline, medium hard to hard, occasionally soft chalky, occasionally very friable, occasionally stylolites filled with dark brown organic material, occasionally fractures, poor to fair intercrystalline porosity.
Dolomite: light brown to dark brown, grayish beige, dark gray, firm, medium hard to hard, crystalline, occasionally sucrose, in places limy, argillaceous, in places stylolites, occasionally vugs, in places anhydrite intercalations, poor intercrystalline porosity, in places fair to good intercrystalline porosity.
Shale: dark gray to black, soft to medium hard, occasionally friable, laminated, occasionally dolomitic, no visible porosity.
Claystone: light to dark gray, soft, friable, occasionally calcareous.
Anhydrite: white to transparent, occasionally brownish, medium hard, occasionally soft, rare crystals.
Depositional environment: Restricted shallow marine – to tidal flat.

2.3 Reservoir Objectives

C2 Primary target:

Interbedded dolomites, limestones, anhydrites and claystones.
Age: Middle Triassic Anisian Ladinian
Reservoir: Fractured dolomites.
Average CRA ϕ 5.13-6.02 %, core ϕ 6.7 %
max ϕ 12.24-14.79%
Seal: Upper Triassic evaporate sequences consisting of salts, claystones and anhydrite.
Source: Lower Triassic Amanus Shale Formation & Middle Triassic Kurrachine Dolomite Formation.

2.4 Source Rock, Hydrocarbon Generation and Migration, Timing

Source Rock

Lower Triassic Amanus Shale Formation

In the Palmyra region, this formation consists of black calcareous marine to lagoonal mudstones, shales and siltstones with TOC up to 20 % averaging 89%. The Kerogene is type I (marine algal). In deeper parts of basin, Amanus shale has probably reached a gas/condensate level.

Middle Triassic Kurrachine Dolomite Formation

Kurrachine Dolomite Formation is partly build up of dark gray dolomite, limestone and mudstones generated in restricted marine environment. Average value of TOC in mudstone is 2%. The Kerogene is type I and type II. The Kurrachine Dolomite is supposed to be fair to very good oil prone source rock. Maturity level over the Hayan block area is expected to be mature to late mature for oil up to gas generation.

Migration

Data from producing fields and wells suggest a vertical migration as a main path from the "kitchen". Migration paths are connected with faults and fracture zones. In the Kurrachine dolomite a system of diagenetic fractures additionally supports vertical migration.
Because of frequent lateral lithology changes, permeability and porosity changes inhibit long distance lateral migration.

Timing

At the time of main structuring (Late Miocene to Pliocene), based on modeling results, Kurrachine Dolomite and Amanus Shale in the west and northwest part of the Hayan block were mostly in main gas generation.

2.5 Seal

For productive upper and middle zone of Kurrachine Dolomite the sealing is provided by limestone, shale and anhydrite from upper and middle part of Kurrachine Dolomite Formation. Kurrachine Anhydrite Formation above Kurrachine Dolomite Formation is the regional seal, ensuring the sealing capacity.

3) Geological Supervisor: Responsibilities and Duties

A pre-spud meeting will be arranged with all Contractors to discuss the procedures that will be followed during the drilling of the well, and answer any questions that may arise.
HPC Geological Supervisor is responsible for supervision of the well evaluation program. This will include the evaluation of hydrocarbon shows, drilling breaks and the gathering of geological data necessary to explore the potential of the Al Mahr object effectively. He will recommend whether to core, test, circulate or log and his decision will only be subject to adequate hole and safety conditions as determined by HPC Drilling Supervisor and approval of the Operation Manager. HPC Geological Supervisor is responsible for ensuring that geological data are collected, evaluated and recorded at the well site and reported to HPC Office Damascus. This includes supervision of Mud logging Contractor and close liaison with HPC Drilling Supervisor and SRPC Supervisor.

3.1. Daily Geological Report

Daily Geological Report is a complete daily update of the geological results of the drilling the well (APPENDIX 1). It should be telephoned or faxed to HPC Office Damascus to the attention of Operation Manager at 08:00 AM hours. Copies of the Daily Geological Report should be retained at the well site by HPC Geological Supervisor and HPC Drilling Supervisor. Copy of the report should be sent to Damascus as a weekly consignment. Daily Geological Report should be compiled from the Daily Mud log Report and Sample Description Sheets. Abbreviations should be kept to a minimum for the sample descriptions. Lithological descriptions should be brief except in the objective intervals.

3.2. Cooperation with Drilling & Geological Supervisor

HPC Geological Supervisor should keep HPC Drilling Supervisor informed of all geological developments and anticipated changes. This is particularly important with regard to zones of hydrocarbon shows, potential coring points and lost circulation zones, as these developments may affect the manner of drilling.
HPC Geological Supervisor should be constantly aware of the drilling fluid program and note changes that may affect sample quality, or introduce contaminants that may affect hydrocarbon shows, geochemical analysis, wire line logging or testing interpretation.

3.3. Transmittal Letters

Transmittal letters will accompany all geological data; reports, samples, logs, equipment etc., going to or from the rig. All transmittal letters will be countersigned by HPC Geological Supervisor. These should be sufficiently detailed to avoid any ambiguity. HPC Geological Supervisor will also countersign transmittals prepared by Mud logging personnel.
Mud logging Contractor shall notify the appropriate people of all movements of personnel and equipment in writing (by fax), as much in advance as possible. For movements from the well site, Operator and Drilling Contractor representative should be notified.

3.4. Confidentiality

All geological data will be considered confidential. Data will be discussed only with those persons directly involved (Mud logging/Data Unit personnel and HPC Drilling Supervisor). Data relating to drilling will be discussed only with the Drilling Contractor representative.

4) Mud logging Program

HPC Geological Supervisor shall supervise the Mud logging personal, who are expected to perform the service detailed in the Mud logging Service.Services to be provided:

4.1. Formation Evaluation and OnLine Computerized Data Monitoring System

- Automatic continuous intelligent lagged evaluation of total gas, chromatographic analysis of hydrocarbons, gas ratio analysis and graphic plots.
- Detailed cuttings analysis; lithology and hydrocarbon evaluation
- Sample preparation and packing
- Correlation of drill cuttings
- Daily Reports preparation, up to date colored mud log, and other outputs requested
- Automatic intelligent on line calibration of all sensors and produce on line hard copy print of measured parameters
- Maintenance of all equipments, sensors and the presence of enough backup spares
- Real time monitoring and listing of drilling parameters plus calculated drilling control and pressure evaluation parameters
- Real time raw and calculated data should be stored in a format that allows conversion to common standards.
- These real time monitoring will be during drilling status, tripping status, kick and kill status.
- The real time monitoring output should be in graphic displays, plots and prints

Note: The estimated mud property while drilling the reservoir interval as illustrated in the table below:

Mud Property	
Type	KCL Mud
Mud Density	1.10 kg/l
Funnel Viscosity	45-50
API Fluid losses	<7

The mud property described above can be modified according to the HPC Drilling and Geological Supervisor decision (This relates to the well & C2 reservoir settings).

4.2. Data Transmission

All the acquired Mud Logging data is requested to be digitally transmitted in real Time while operations.

4.3. Sample Collection, Description and Dispatch

- The Mud logging crew are to catch, wash, describe and package samples. Cuttings returns must be properly lagged, with carbide or other appropriate lag checks made at regular interval (at least every 100m of hole drilled) and noted on the log.
- The Mud logging Engineer should ensure that the cuttings samples are not contaminated.

A total of 2 (two) sets of samples (1 for SPC, 1 for HPC) will be collected as follows:

TYPE	INTERVAL	DEPTH
Documentation (unwashed) 400 g	5 m	Conductor - TD
Lithology (washed & dried) 200 g	10 m	Conductor - 13 $^{3/8}$
Lithology (washed & dried) 200 g	5 m	13 $^{3/8}$ - TD
Paleontology (washed & dried) 200 g	10 m	Conductor - 13 $^{3/8}$
Paleontology (washed & dried) 200 g	5 m	13 $^{3/8}$ - TD
Geochemical (unwashed) 500 g	20 m	13 $^{3/8}$ - Top K.D.Fm.
Geochemical (unwashed) 500 g	5 m	K.D.Fm. - TD

During coring, while circulating drilling breaks, or near the objective zone, cuttings samples will be collected more frequently at 1 m intervals or similar (according to the HPC Geological Supervisor decision) for examination and retained as an additional sample set for HPC.

Sample Description; All cutting samples are to be examined and described immediately by the Mud logging Engineer. Mud additives observed in the cuttings should be recorded also. Cuttings are to be examined immediately under ultra violet light for fluorescence and cut with solvent. The type of solvent used should be noted in the description.

All samples are to be carefully labeled with Operator's name (HPC), well name (Al Mahr6), type of sample and depth interval. They are to be securely boxed for transport to HPC Office Damascus with boxes labeled (on top, one end and one side) with the above data, as well as the set designation, and addressee. Transmittals must accompany every dispatch.

It will be necessary to send each completed box of samples to HPC Office Damascus for transshipment.

Calcimetry Measurement: Calcimetry Measurement will be made from the conductor to the depth of 9 $^{5/8"}$ casing depth at 20 m intervals. Below the 9 $^{5/8"}$ casing depth measurements will be made at 10 m intervals or more frequently if required.

Thin Section Preparation: According to the HPC Geological Supervisor decision certain amount of thin sections should be prepared on site for quick look interpretation.

4.4. Master Log

This is an interpretative Lithological/drilling data log and is to be kept current on the reproducible scale 1:500; 1:1000 (metric scale).

The log will incorporate the following:

- Lithology percentage, description and interpretations
- Visual porosity
- Drill rate
- Ditch gas
- Chromatograph data
- Oil show description
- Core intervals and description
- Mud data
- Bit data and other pertinent engineering details
- Deviation surveys

Original log sheets will be sent to HPC Office Damascus as they are completed on weekly basis. According to the special circumstances parts of the log should be faxed daily to the HPC Office Damascus.

4.5. Full Pressure detection Services

In accordance of well logging

5) Wireline logging program

Initially, HPC Geological Supervisor determines the point at which a logging run will be made in accordance with the specified program. Due to hole problems or shows, that a deviation from the established program may be necessary, the geologist's judgment becomes critical. It is responsibility of HPC Geological Supervisor to liaise with the wire line logging engineer on the rig for all matters relating to the well.

5.1. Open Hole Logs

This well will be logged with complete set of logging tools for determination of petrophysical parameters and characterization of fracture system in the targeted reservoir. Choice of the logging tools is responding to water base mud (WBM) as predicted working fluid. In case that oil base mud (OBM) will be used some of the logging tools will be replaced (see under remarks). In case of bad borehole conditions that would disable any wire line logging, only upon decision from HPC Office Damascus, logging with drilling pipes (TLC) will be run.

Logging before setting casing 16"or 20" :
Run 1: BHC/GR/CAL
Formation: KERMAV ,Shiranish.

Logging before setting casing 12 $^{3}/_{4}$" or 13 3/8" :
Run 1: BHC/GR/CAL
Formation: Soukhne , Judea, Hayane, Rutbah, Hara Moun, Butmah.

Logging before setting casing 9 $^{5}/_{8}$"
Run 1: BHC/GR/CAL
Formation: Kurrachine Anhydrite

Final logging at TD 2500 m (before setting casing 7")
Run 1: LDL/NEUTRON/DEN/MSF/CAL/NGS
Run 2: GR/BHC.
Formation: Kurrachine Dolomite (C2)

5.2. Cased Hole Logs (it may modified by HPC supervisor in accordance of well logging)

For stages before setting reservoir casing:
Run 1: CBL(GR-CCL-CBL) for every stage.
For reservoir casing:
Run 1: CBL(GR-CCL-CBL)
Run 2: GYRO.
Run 3: VSP

5.3. Log evaluation

An initial "quick look" log interpretation will be carried out at the well site and in HPC Office Damascus by HPC well logging analyst. Complete log analysis will be carried out in Damascus by HPC Development Department. The original copies of logging data countersigned by HPC well logging analyst should be transmitted to HPC Damascus Office.

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HPC Development Department. The original copies of logging data countersigned by HPC well logging analyst should be transmitted to HPC Damascus Office.

6) Casing program

16"or 20" casing
The 16"or 20" casing should be set inside Soukhne Formation (349 m).

12 3/4" or 13 3/8"
The 12 3/4" or 13 3/8" casing should be set when Kurrachine Anhydrite formation will be reached.

9 ⅝" casing
The 9 ⅝" casing should be set when Kurrachine Dolomite Formation will be reached.

7" casing
The 7" casing should be set in assembly with landing collar (TD 2468 m inside C2).

7) Drill stem Test (DST) if it is available

A decision whether to test any zones of interest will be by HPC Office Damascus based upon wire line log analysis and show evaluation. Drill stem testing (If it's not available Flow Pressure Build Up (FPBU)) will be the responsibility of the Contractor and supervised at the well site by the HPC reservoir engineer. A separate report will detail the DST results.
Any sample of oil, condensate , gas or water recovered by testing will be submitted to a laboratory for PVT analysis. In addition, samples will be forwarded to Laboratory Contractor for detailed geochemical analysis and supplementary PVT work.

8) Drilling Hazards

Mud Losses
According to all previously drilled wells partial to total mud losses should be expected from Soukhne Rmah Chert member (lower part). On wells Al Mahr-1 and Al Mahr-2, total mud losses were not stopped and long section of blind drilling down to Butmah fm was done that had an impact on cost and time schedule (additional water supply, tool stuck and tool fishing, side tracking). On Al Mahr-3, total mud losses in Soukhne Rmah Chert Mb were promptly treated with several cement plugs and drilling through Judea was continued with circulation (additional partial mud losses were controlled with LCM pills). Therefore, it is strongly recommended to apply the same strategy when total mud losses occur. Further, water supply has to be organized to avoid a lack of water (large water pit of 10000 m_3 is proposed). In targeted C2 reservoir partial mud losses could occur due to presence of highly fractured zones, but drilling with "drill in" (MW up to 1.10 kg/dm_3) did not encountered with serious problems inside C2 reservoir.

Borehole instability
Different stress regimes affected the underground from paleostress to the recent one. From drilling experience, the main point regard to this matter is noted in the Kurrachine Anhydrite Fm. Overpressured claystone with trapped water can cause tool stuck and have to be put under control with higher MW. Assumption is that water, in originally deposited clay, was trapped vertically and laterally between salt deposits and become overpressured when overburden pressure due to

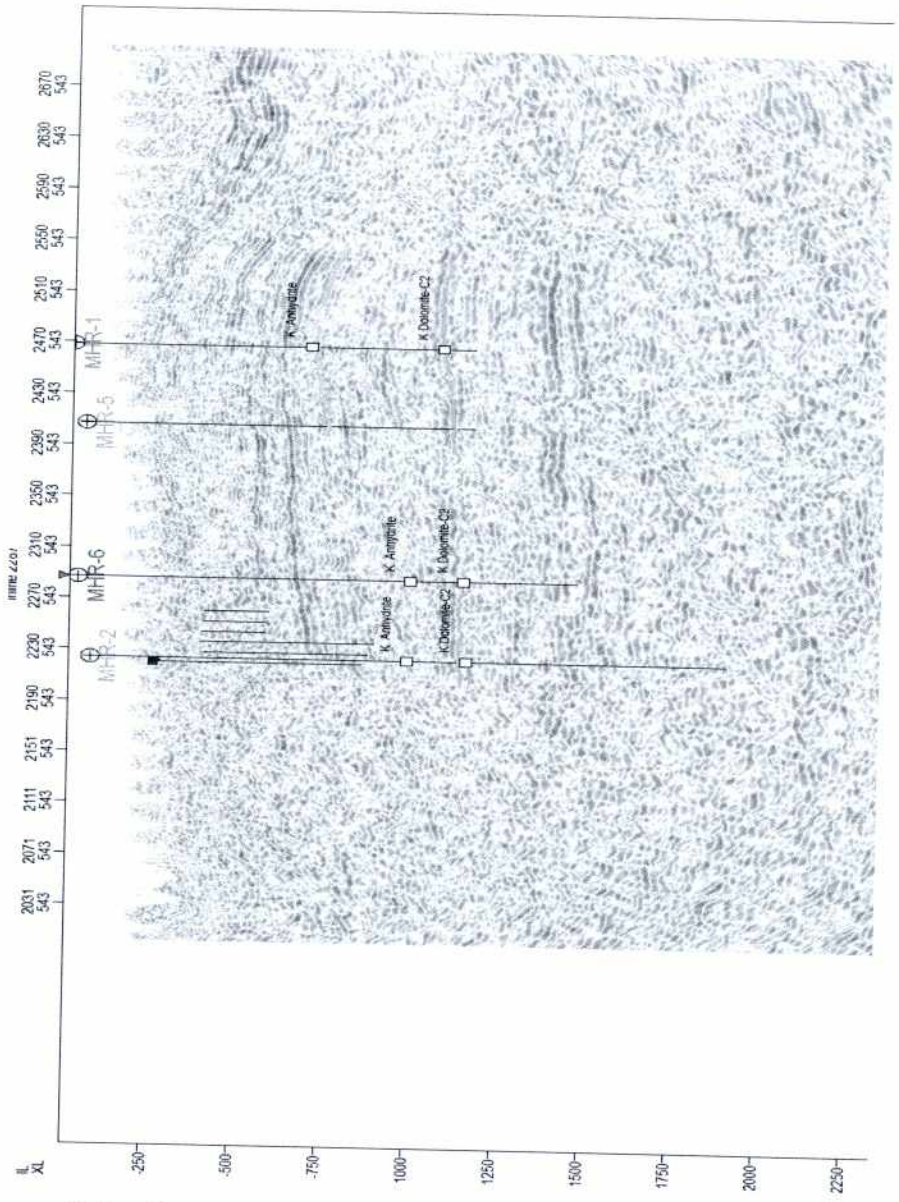
deposition of younger formations has been increased. Also, salt creeping is possible due to same overburden pressure (slower movement). Pore pressure and overburden are expected to cause fewer problems than on neighboring Jihar, Jazal and Mazrur field where burial depth of Kurrachine Anhydrite Fm is deeper.
Prediction of pore pressure, ECD (in case of similar drilling regime & well construction), fracturing pressure and overburden gradient equivalents (per formation) is given in the following table:

Formation		GPDP	GECD	GFDP	DCOB
SHIRANISH		1.05	1.06	1.24	2.13
SOUKHNE		1.06	1.07	1.37	2.09
JUDEA		1.05	1.06	1.48	2.13
HAYANE		1.04	1.05	1.54	2.17
RUTBAH		1.05	1.05	1.57	2.18
HARA	MOUN	1.05	1.06	1.61	2.19
BUTMAH		1.06	1.08	1.66	2.22
K.ANHYDRITE	Pre-Salt	1.09	1.6	1.89	2.23
Salt		1.23	1.79	2.12	2.27
K.DOLOMITE		1.06	1.11	1.88	2.31

Other Safety factors
Material selection depends on corrosive contaminants, such as CO_2 and H_2S. The basic parameters, which are taken into consideration, are partial pressure of carbon dioxide and hydrogen sulfide, as well as the temperature and chloride content.
PVT analyses for considered reservoir show absence of H_2S in produced fluid.
Measured CO_2 content is:

CO_2 = 1.8 mol % (gas sample from C2 reservoir).

9) APPENDIX



Seismic cross section of AlMahr wells (inline 2287)

DAILY GEOLOGICAL REPORT:

INA – NAFTAPLIN GEOLOGICAL EXPLORATION & DEVELOPMENT DIVISION **Mud Logging Services**	**DAILY GEOLOGICAL REPORT** Well name: Concession: Report No.				Date: Spud Date:	
COORDINATE:	Longitude :			Latitude :		
K.B. :		**G.L. :**				
DAYS FROM SPUD : PLANNED DAYS :		OPERATION AT 6:00 AM : GEOLOGICAL SUPERVISOR :				
DEPTH (6:00 AM) : Depth of prognosis : Casing diameter : Bit size : R. O. P. Avg. R.O.P. :	m m m m m / h m / h	Hv = Hv = Shoe at: Drilled: Last WLL	m m m m / 24 m	Weight on bit : Rotation per minute : Torque : Stand pipe pressure : Flow in : Flow out :	t rpm Apm bar l / min l / min	
Mud		In		Out		
Density Temperature Salinity	kg / dm^3 ° C NaCl/cm^3					
GP fm (equlv.) ECD GP frac. (equvl.)	kg / dm^3 kg / dm^3 kg / dm^3	DCS :		Sigma [Σ]:		
Age :						
Cuttings description and CH-shows:						
Core No. :	Interval:	m	Drilled	m	Recovery:	%
Gas shows % (NG, BG, TG, CG, RG, chromatograph analysis, H_2S, CO_2, ...) - DST						
Note :						

Well Prognosis & Logging Program
Al-Mahr-6

Well Location

TM COORDINATES (Clarke 1880)
X: 333 621.62 Y: 305 125
INLINE: 2287 CROSSLINE: 543

Ground Elevation: 702 m

KB level: 6m

Planed TD: 2468

Target: C2 Reservoir (gas & condensate)

Casing program:

16" casing to 349 m.

12 3/4 " casing to Butmah Fm.

9 5/8 " casing to C2 Reservoir

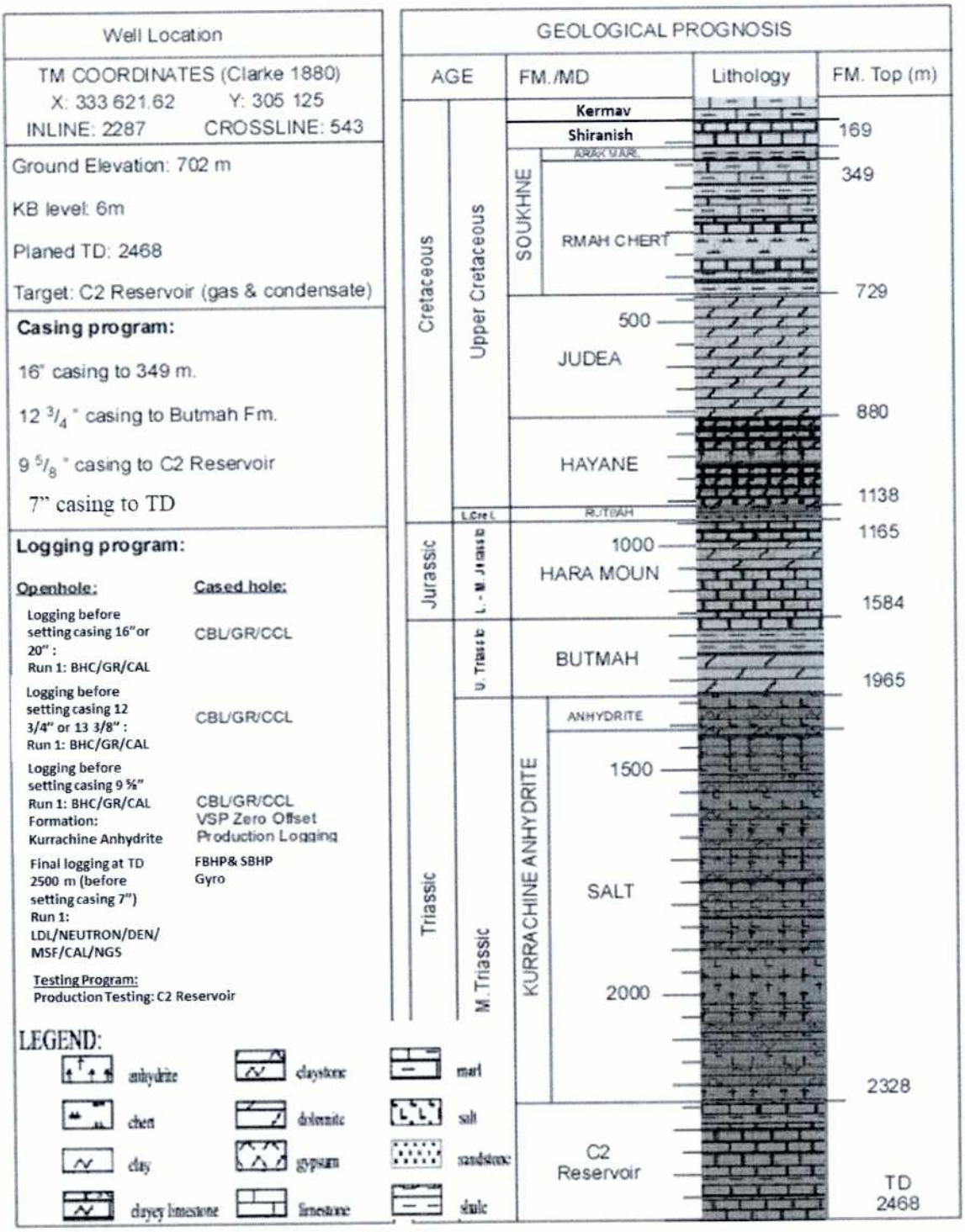
7" casing to TD

Logging program:

Openhole:	Cased hole:
Logging before setting casing 16"or 20" : Run 1: BHC/GR/CAL	CBL/GR/CCL
Logging before setting casing 12 3/4" or 13 3/8" : Run 1: BHC/GR/CAL	CBL/GR/CCL
Logging before setting casing 9 5/8" Run 1: BHC/GR/CAL Formation: Kurrachine Anhydrite	CBL/GR/CCL VSP Zero Offset Production Logging
Final logging at TD 2500 m (before setting casing 7") Run 1: LDL/NEUTRON/DEN/ MSF/CAL/NGS	FBHP& SBHP Gyro

Testing Program:
Production Testing: C2 Reservoir

LEGEND:
anhydrite, chert, clay, clayey limestone, claystone, dolomite, gypsum, limestone, marl, salt, sandstone, shale



INTEGRATED WELL PREDICTION
DEVELOPMENT WELL ALMAHR-6