पेट्रोलियम एवं
प्राकृतिक गैस मंत्रालय
MINISTRY OF
PETROLEUM AND NATURAL GAS

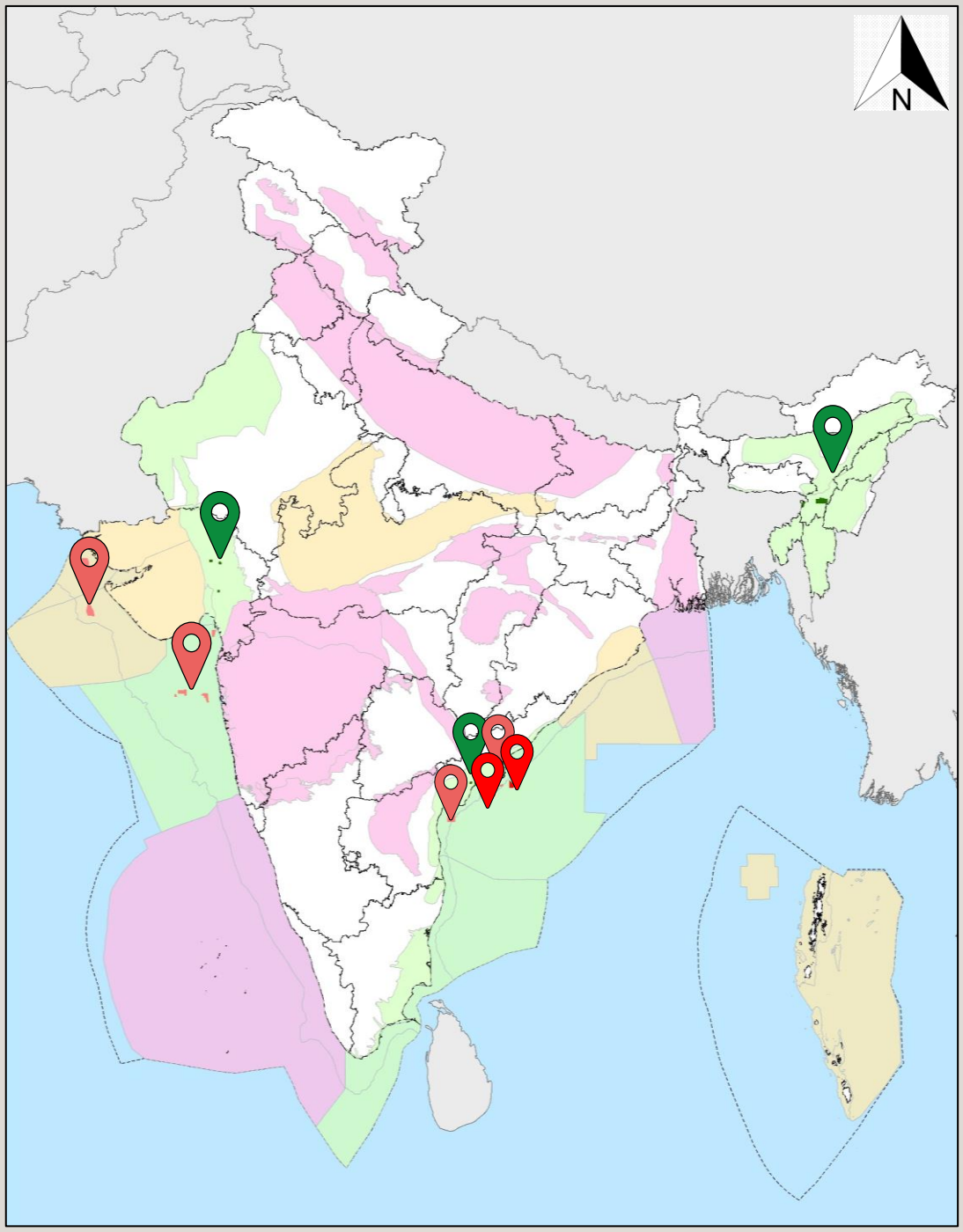
सत्यमेव जयते

DGH

DIRECTORATE GENERAL OF HYDROCARBONS

(Ministry of Petroleum & Natural Gas,Government of India)

INFORMATION DOCKET



CONTRACT AREA

GK/OSDSF/GKOSN/2025

DISCOVERED SMALL FIELD BID ROUND - IV

DISCLAIMER

This document, titled Information Docket, provides a consolidated overview of the Contract Area comprising the discoveries/fields offered under the Discovered Small Fields (DSF) Bid Round-IV. This docket has been prepared based on original inputs /information received from National Oil Companies, Private Operators/JV and available at National Data Repository (NDR).

Third Parties were engaged to independently assess the information and estimate the in-place volumes. In conducting these estimations, Third Parties used the available data/information and employed assumptions, procedures and methods deemed necessary given the timeframe available for evaluation.

The accuracy and clarity of the information presented herein, including the reported hydrocarbon resources, are thus limited to the data available at the time of analysis and the verifications performed by the Third Parties during the evaluation timeframe. The findings are subject to further review and validation by bidders upon receipt of additional and clarified data/information.

Given these limitations, all bidders are hereby advised to undertake their own independent technical and commercial due diligence and conduct thorough evaluations of the data and resource potential to support informed investment and bidding decisions.

Contents

INTRODUCTION

With the extension of the DSF policy 2015, DSF Bid Round IV offers 55 small-to-mid-size oil and gas discoveries through international competitive bidding. There are 9 contract areas under DSF-IV spread over Cambay, Assam & Arakan, Gulf of Kutch, Mumbai Offshore and Krishna Godavari Basins. Out of 55 discoveries, there are 19 onshore discoveries in 3 contract areas, 26 shallow water discoveries in four contract areas and 10 Deepwater discoveries in two contract areas. The discoveries have been suitably clustered in order to leverage shared resources and operational flexibility

In terms of hydrocarbon prospectivity, the fields-on-offer lie in 5 sedimentary basins which include 8 Contract areas in Category I basins with hydrocarbon reserves and 1 Contract area in Category II basins with contingent resources.

Each contract area on offer has multiple discoveries, comprehensively described in this Information Docket to bring in all relevant subsurface facts of geo-scientific and engineering information. This technical booklet will be useful if read while working with the Data Package which would be available on sale once the Data Room is set up for viewing.

1. CONTRACT AREA DESCRIPTION

The contract area, titled, GK/OSDSF/GKOSN/2025 is located in the offshore shallow water within Gulf of Kutch and Saurashtra offshore Basins and has an offered area of 2101.51 Sq. km. under this DSF Bid Round IV. The Contract area GK/OSDSF/GKOSN/2025 has three different Polygons with details presented in Table 1-1.

Table 1-1: Polygons within Contract Area GK/OSDSF/GKOSN/2025

Details of Contract Area GK/OSDSF/GKOSN/2025

Total Contract Area : **2101.51** SqKm
No. of Discovery Wells in Contract Area : **7**
Total No. of Wells in Contract Area : **19** (including Discovery wells)
No. of Polygons Covered in Contract Area : **3**

S. No.	Name of Polygon	Area, SqKm	No. of Discovery Wells	Total No. of wells	In Place (O+OEG) MMTOE	In Place (O+OEG) MMTOE (As per Erstwhile Operator)	In Place (O+OEG) MMTOE (As per Erstwhile Operator DoC)
1	GK-1	50.46	1	1	0.017	0.02	0.021
2	GKOSN	1372.65	4	14	14.49	12.56	12.25
3	GSOSN	678.4	2	4	16.48	17.3	14.69
Total		**2101.51**	**7**	**19**	**30.99**	**29.88**	**26.97**

GK-1 polygon has one discovery GKS092NAA-1, GKOSN polygon has four discoveries GKS091NDA-1, GKS091NFA-1, GKS101NAA-1 & GKS101NCA-1 and GSOSN polygon has two discoveries with GSS041NAA-1 & GSS041NAA-2. In total, there are 7 discoveries in these three polygons and 19 wells have been drilled in the contract area (refer to Figure 1-1). There are two more hydrocarbon bearing wells, GK-22C-1 in GKOSN Polygon and GKS041NAA-3 in GSOSN wells. Both these wells produced gas on testing.

The contract area with these 7 discoveries is estimated to have around 29.86 MMTOE of in-place hydrocarbon based on estimates made by previous operator(s).

In the map, enclosed with the NIO (Notice Inviting Offer) Document, the contract area is referred to S-4. The following figure(s) show(s) the contract area details across the field(s) and/or cluster(s).

The seismic coverage maps for each polygon are provided in Figure 1-2 for GK-1 and GKOSN and Figure 1-3 for GSOSN respectively.

Figure 1-1: Details of GK/OSDSF/GKOSN/2025 Contract Area

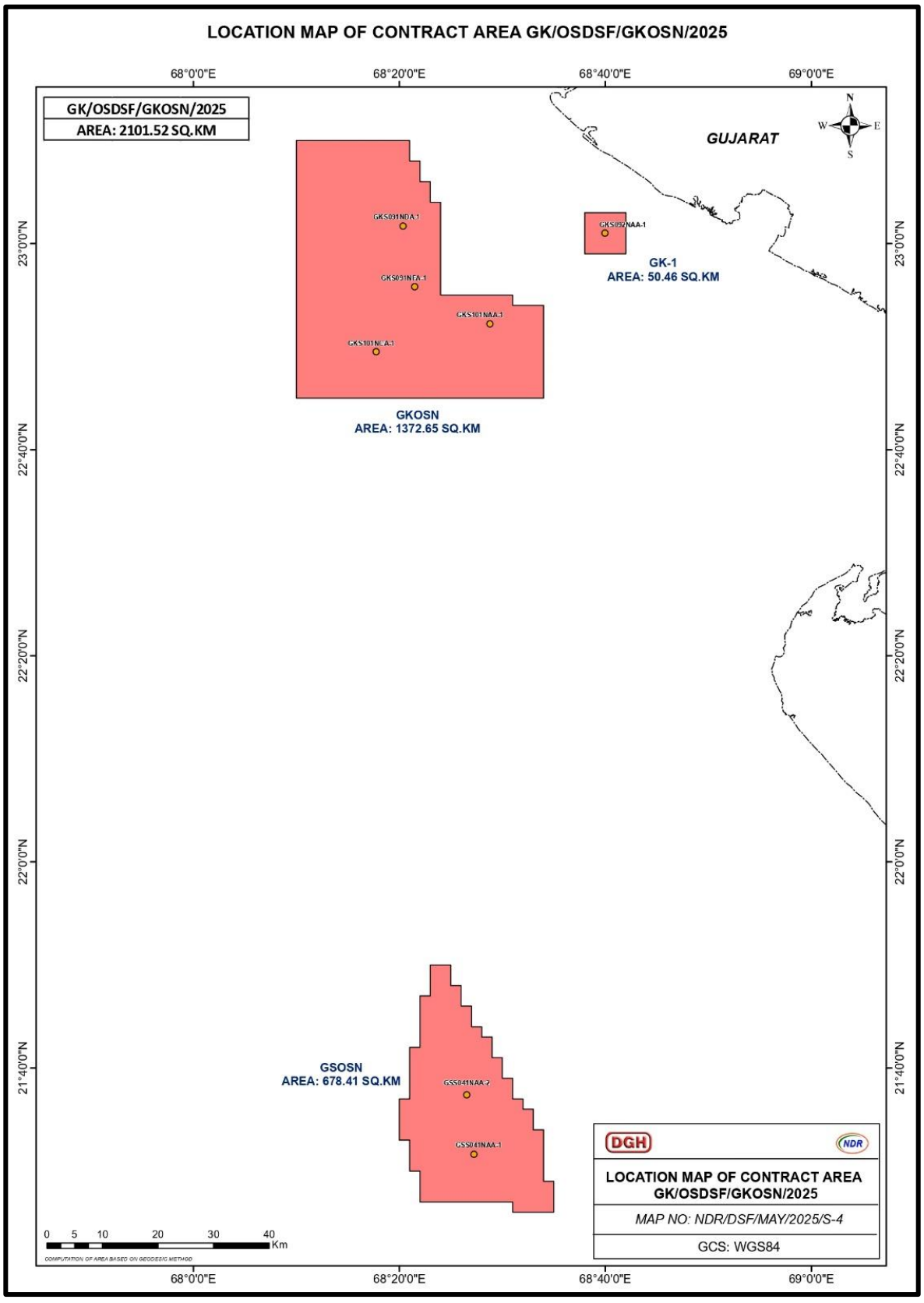


Figure 1-2: Map showing Seismic Coverage & Wells - GK/OSDSF/GKOSN/2025 Contract Area

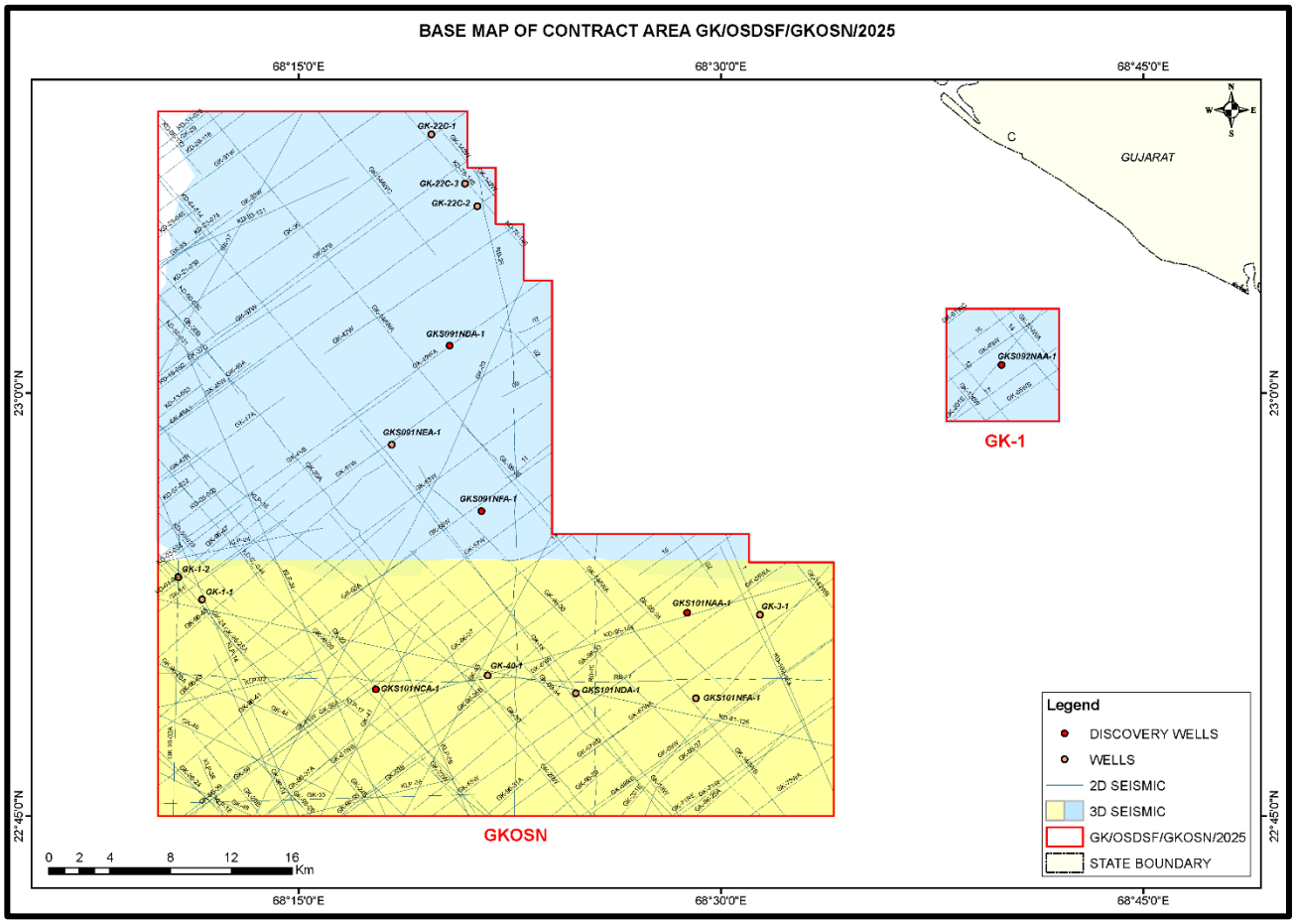
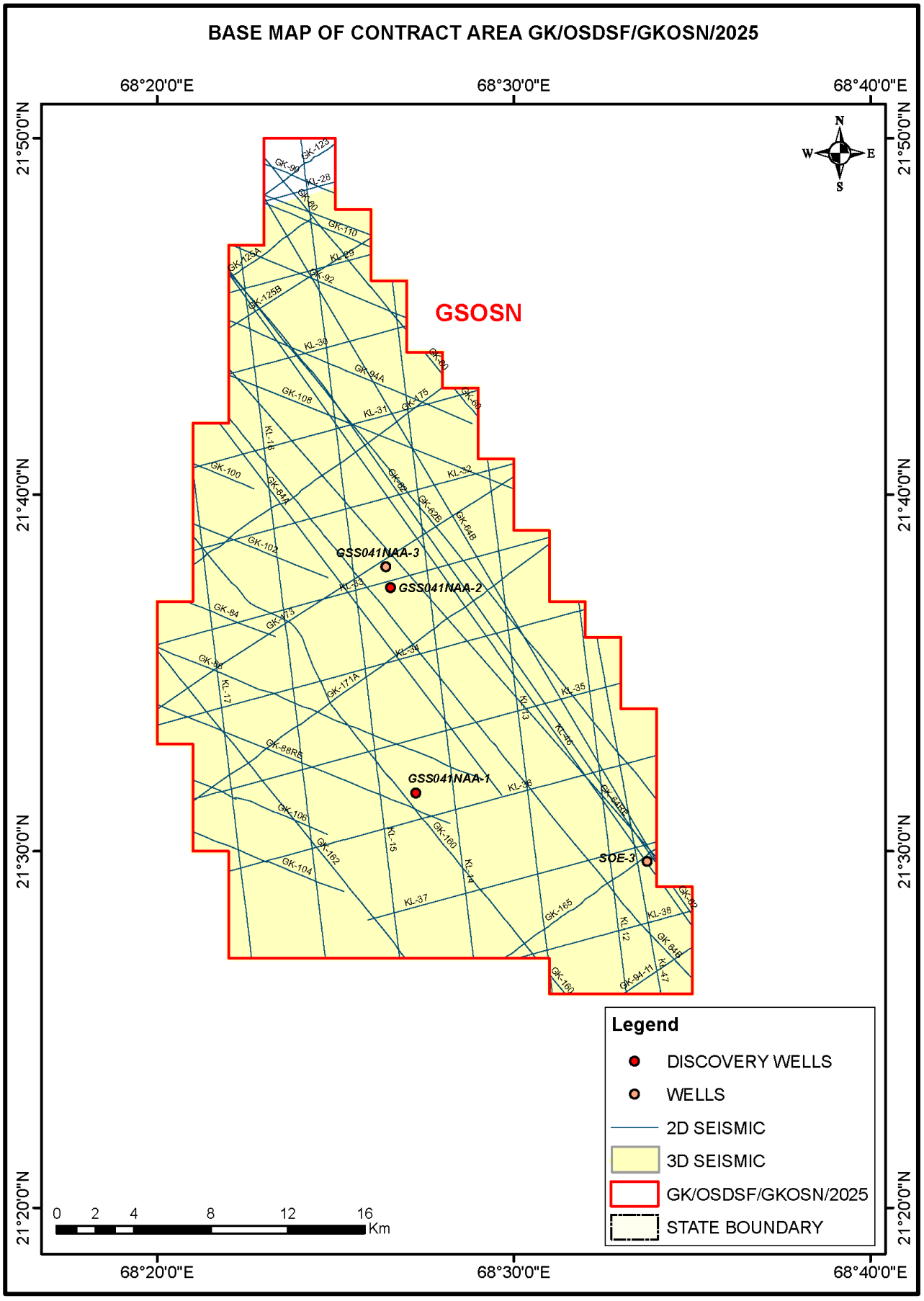


Figure 1-3: Map showing Seismic Coverage & Wells - GK/OSDSF/GKOSN/2025 Contract Area



2. PHYSIOGRAPHY AND ACCESSIBILITY OF THE AREA

Two coastline indentations, the Gulf of Kutch and the Kori Creek in the southern and the northern parts of the basin, are prominent features (refer to Figure 2-1). The Kutch Basin area experiences a semi-arid climate with temperatures varying widely between 11°C and 33°C. Extreme variation in temperature is from 10°C to 48°C. The winter season extends from December to February. There is a long spell of hot summer from March to June followed by a period of southwest monsoon between June and September when erratic rain occurs. The region of Kutch receives an average annual rainfall of about 32cm.

Ahmedabad and Mumbai are the nearest international airports & Bhuj Airport is the nearest Domestic Airport. Bhuj, Porbandar and Rajkot are important towns with road, train and air connectivity. Bhuj is the nearest city at a distance of 100 KM, Kandla (Deendyal), Mandvi, Mundra and Jakhau are other coastal cities. The primary ports in the Gulf of Kutch are Kandla Port, Mundra Port, Mandvi Port and Jakhau Port. There are other ports in the regions namely Okha, Bedi and Navlakhi.

The areas of Rann are less accessible during the monsoon due to the formation of salt marshes. Kandla, with newly built modern port facilities, is located in the south-eastern part of mainland and is a free trade zone.

Figure 2-1: Satellite imagery of the contract area GK/OSDSF/GKOSN/2025

3. RELEVANT SEDIMENTARY BASIN INFORMATION

3.1 KUTCH & SAURASHTRA BASIN DESCRIPTION

3.1.1 Kutch Basin Description

The Kutch Basin is a Category-II Basin and has an area of 58554 Sq. km. with 30754 sq. km. Onland area, 20500 Sq. km (refer to Figure 3-1) Shallow water area (up to 400m water depth) and 7300 sq. km. Deepwater area. In the Kutch Basin, there are 17 plays present within Mid Jurassic to Cretaceous in Onland and Mid Jurassic to Trap to Mid Miocene in Offshore. There is an opportunity for exploring Mesozoic Plays also (refer to Figure 3-4 and Figure 3-5).

Exploration in the basin started in the early 1960's with the first offshore seismic survey conducted during 1964-65. Since then, the whole area has been covered with various campaigns of 2D, 3D, and long-offset seismic data along with gravity and magnetic surveys. Subsequently, many blocks have been awarded in the basin under Nomination, NELP, OALP & DSF rounds.

3.1.2 Basin Prospectivity

The Resource assessment of the Kutch Basin was earlier assessed during 1995-96 along with 14 other basins. In the Hydrocarbon Resource Assessment Study (HRAS) conducted in 2017, 3D Petroleum System Modelling (PSM) and Aerial Yield methods were used. The Kutch basin is a Category II basin in the newly formulated three-tier category (Category-I, II & III), implying the fact that the basin has sub-commercial discovered in-place ('Contingent Resources'), which needs to be expeditiously developed for commercial production. The current categorization is in tune with the industry standard PRMS guidelines and conforms to various policies in place or under implementation by Government of India.

The Kutch basin has a total unrisked hydrocarbon in-place of 898 MMTOE, out of which 71 MMTOE has been discovered which is entirely sub-commercial in-place. The remaining 827 MMTOE, nearly 92% of total in-place has potential to be explored and discovered. The play-level hydrocarbon in-place (unrisked total petroleum) for Offshore area is as given below:

Kutch Basin Prospectivity:

Tertiary Mid Miocene Clastic	: 15 MMTOE
Tertiary Late Oligocene Clastic	: <1 MMTOE
Tertiary Early Eocene - Clastic-Carbonate	: 48 MMTOE
Tertiary Paleocene - Clastic-Carbonate	: 72 MMTOE
Mesozoic Weathered Basalt	: <1 MMTOE
Mesozoic Late Cretaceous - Carbonate-Clastic	: 148 MMTOE
Mesozoic Early Cretaceous	: 273 MMTOE
Mesozoic Late Jurassic	: 6 MMTOE
Mesozoic Mid Jurassic Upper	: 33 MMTOE
Mesozoic Mid Jurassic Lower	: 267 MMTOE

3.1.3 Opportunity in the Basin

In the offshore area of Kutch and further south, the Kutch basin is contiguous with Saurashtra Offshore basin. Middle Miocene and Early Eocene are the main pays and additional hydrocarbons plays are established in Paleocene, Late Cretaceous, and Early Cretaceous in the basin. All the hydrocarbon accumulations are related to mild inversion tectonics involving Mesozoic and Tertiary sections. There have been multiple discoveries in Kutch Offshore under Nomination, NELP & DSF regimes, some of them are under development and 7 discoveries are on offer under current DSF-IV rounds.

3.1.4 Saurashtra Basin Description

Saurashtra is a Category II basin, implying that the basin has sub-commercial discovered in-place, which needs to be adequately appraised and developed for commercial production. Onland sub-basin partially overlaps with the state(s) of Daman & Diu and Gujarat. The Saurashtra basin has an area of 194,114 sq. km. with 75,076 sq. km. onland area, 42,617 sq. km. shallow water area and 76,421 sq. km. deepwater area. In the Saurashtra Basin, 16 plays have been identified within Mid Jurassic to Early Cretaceous in Onland and Mid Jurassic to Trap to Mid Miocene in Offshore. Saurashtra basin is geologically contiguous with Kutch basin and separated by the Saurashtra Arch in the offshore part, which trends NNW- SSE direction.

The basin has a presence of prospective plays of Middle Jurassic to Early Cretaceous with significant potential of sub-basalt Mesozoic plays. There has been a gas discovery in Early Cretaceous reservoirs below the thick weathered basalts. The northerly located proven Tertiary Plays of Kutch basin also extend into this basin.

Major part of Saurashtra mainland is covered with Deccan Trap basalts with thin veneer of Miocene and younger sediments, exposed along Porbandar coast. The Cenozoic sediments have been encountered in the wells drilled in the offshore Saurashtra basin and expected to be present below the Deccan trap basalts in the offshore. In offshore, the basin lies north of proven Mumbai offshore Basin, while the onland part borders with Cambay Basin on its eastern flanks. Thus, in onland part of Saurashtra basin, Mesozoic strata are only present.

3.1.5 Basin Prospectivity

There are 16 plays within Middle Jurassic-to-Early Cretaceous in Onland and Middle Jurassic-to-Trap-to-Middle Miocene in Offshore. The resource assessment of the basin was earlier assessed during 1995-96 study along with 14 other basins. During the 2017 Hydrocarbon Resource Assessment Study (HRAS), 3D PSM and Aerial Yield have been used. 2D seismic data are reported combined with Kutch Basin due to the contiguity of datasets. The HRAS conducted in 2017 also incorporated information of 27 drilled wells. 3D PSM and Trap Density method have been used to assess hydrocarbon resources. Sub-basalt imaging, variable basalt thickness and inadequate onland seismic data are a few challenges. Cretaceous plays can also be focus area.

The Saurashtra basin has a total hydrocarbon in-place of 310 MMTOE, out of which 79 MMTOE has been discovered which is entirely sub-commercial in-place. The remaining, 231 MMTOE, nearly 75% of total in-place is potential to be explored and discovered. Onland sub-basin has a total hydrocarbon in-place of 33 MMTOE and this is entirely undiscovered risked in-place. The basin has 100% of total in-place, potential to be explored and discovered. Offshore sub-basin has a total hydrocarbon in-place of 267

MMTOE. This includes discovered in-place of 70 MMTOE and undiscovered risked in-place of 197 MMTOE. The discovered in-place is subject to commercial development. The basin has 73.8% of total in-place, potential to be explored and discovered. The play level undiscovered (risked) hydrocarbon in-place for Offshore area is tabulated below:

Saurashtra Basin prospectivity:

Tertiary Middle Miocene Clastic	: 7 MMTOE
Tertiary Early Eocene, Clastic	: 7 MMTOE
Tertiary Early Eocene - Carbonate	: 3 MMTOE
Tertiary Paleocene – Clastic	: 3 MMTOE
Tertiary Paleocene - Carbonate	: 8 MMTOE
Tertiary Paleocene - Weathered Basement	: 22 MMTOE
Mesozoic Late Cretaceous- Clastic	: 5 MMTOE
Mesozoic Late Cretaceous - Carbonate	: 3 MMTOE
Mesozoic Early Cretaceous	: 5 MMTOE
Mesozoic Late Jurrasic	: 16 MMTOE
Mesozoic Upper Jurassic	: 16 MMTOE
Mesozoic Lower Jurassic	: 67 MMTOE

3.1.6 Opportunity in the Basin

As of 31.03.2024, NDR has archived data of 196,462 LKM 2D seismic, 29,624 SKM 3D seismic, and 38 wells. Under various campaigns by Govt. of India, Geophysical data were acquired, initially in onland basins and later, extended to offshore areas. Under National Seismic Programme (NSP), 2,306 LKM 2D seismic data were acquired. In another initiative, titled Mission Anveshan, 660 LKM 2D seismic are planned as an in-fill data acquisition campaign of NSP. Pandit Deendayal Energy University (PDEU), Gandhinagar, India has also carried out Geoscientific data analysis as a part of basin-scale research study.

In the recently concluded OALP Round IX, eight blocks (Five in offshore and three in Onshore) have been awarded in the Kutch Saurashtra Basins. Under OALP Bid Round VIII, one deepwater block of 2,743 sq km area was awarded.

Figure 3-1: Indian Sedimentary Basins

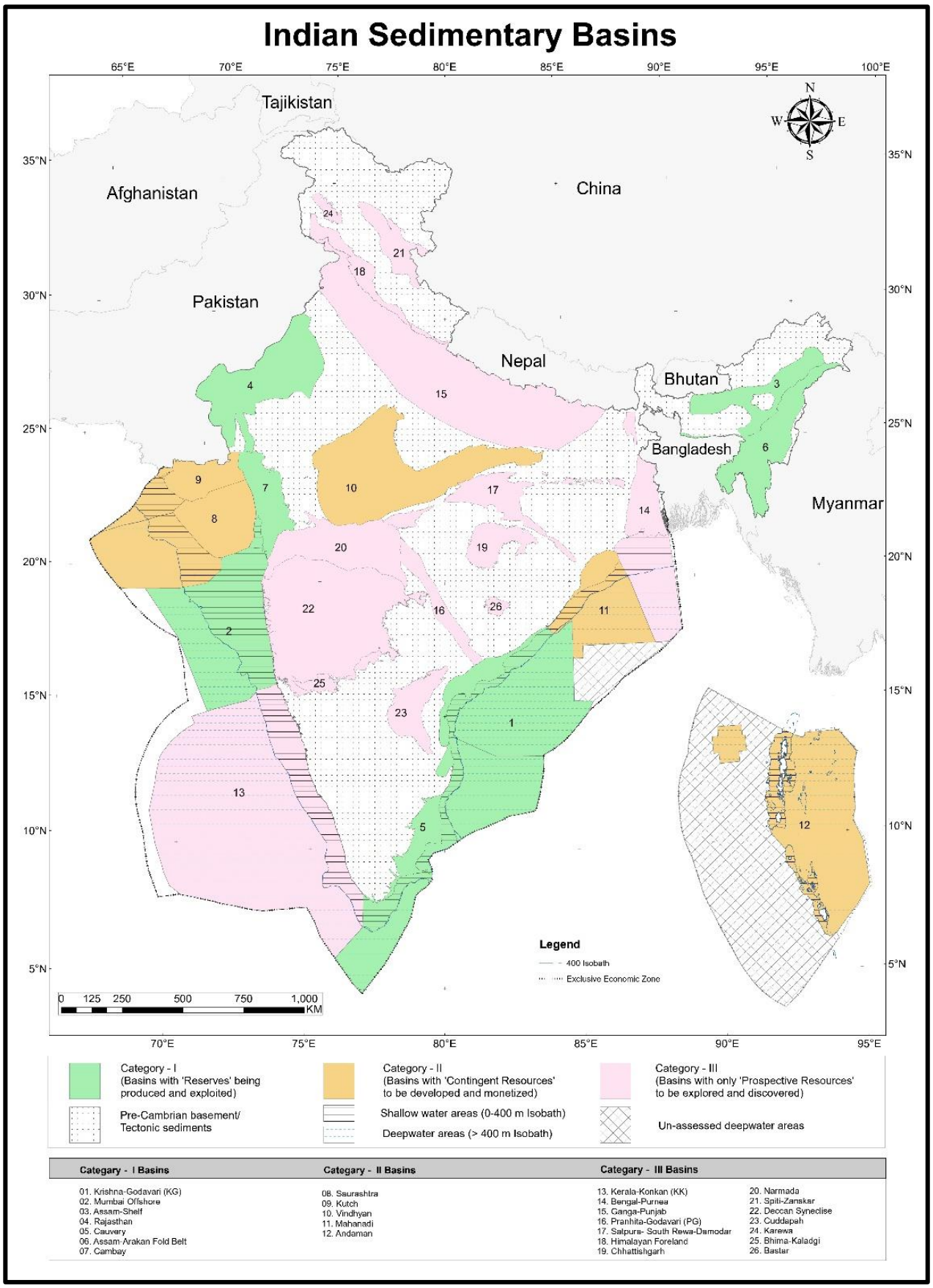


Figure 3-2: Discoveries/Fields-on-offer in the basin (Polygon GK-1 & GKOSN)

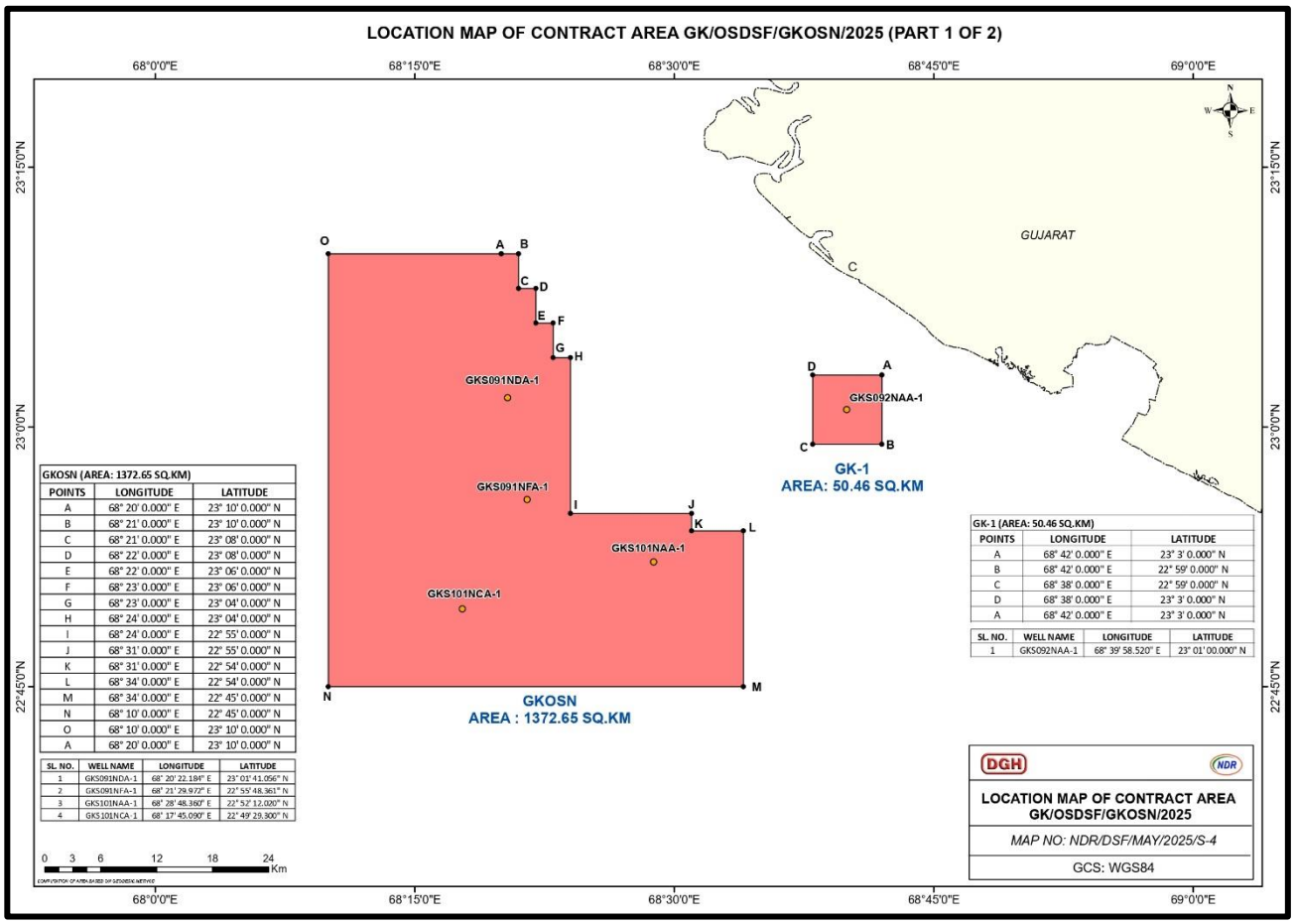


Figure 3-3: Discoveries/Fields-on-offer in the basin (Polygon GSOSN)

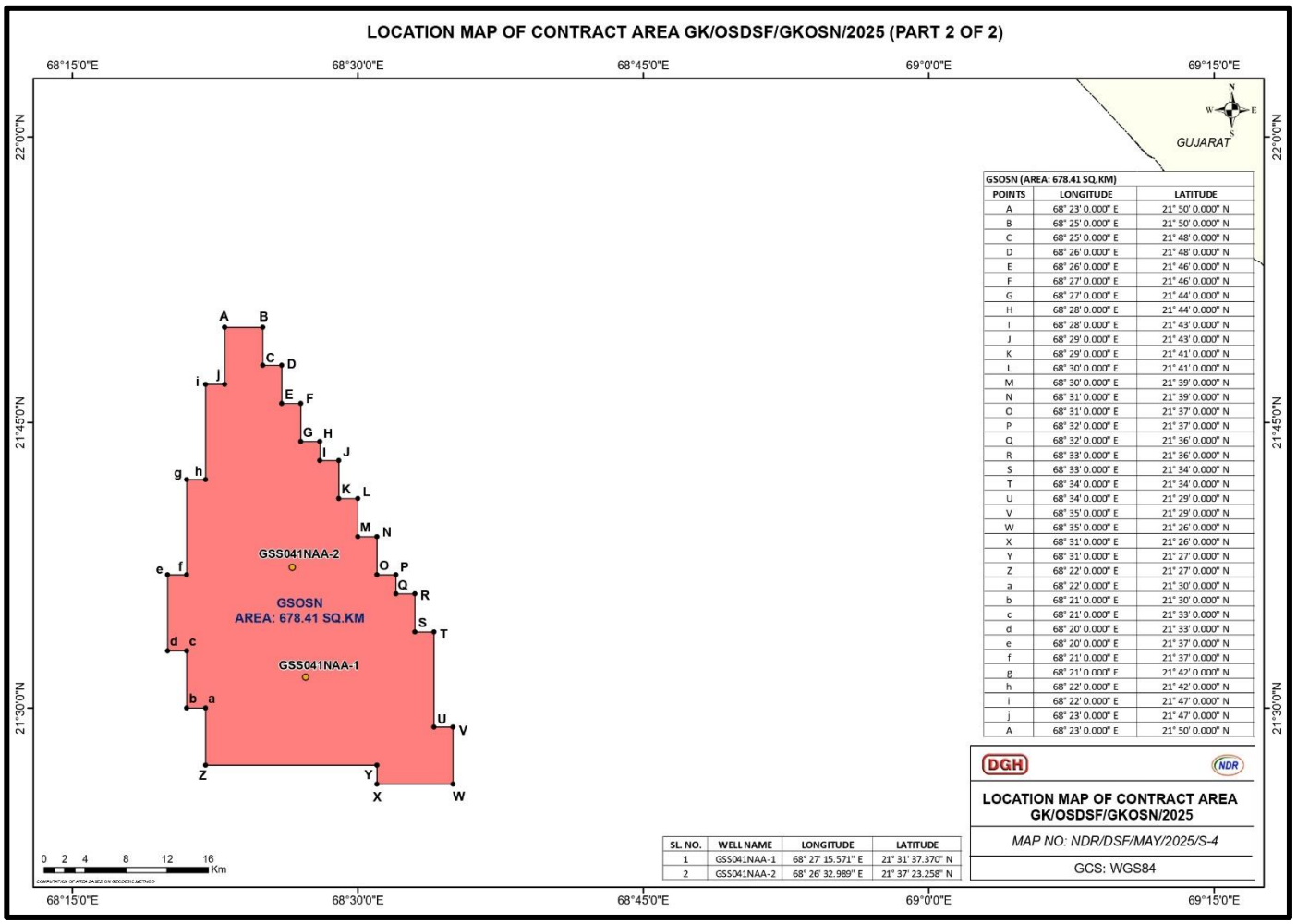


Figure 3-4: Generalized stratigraphy of the Kutch Basin

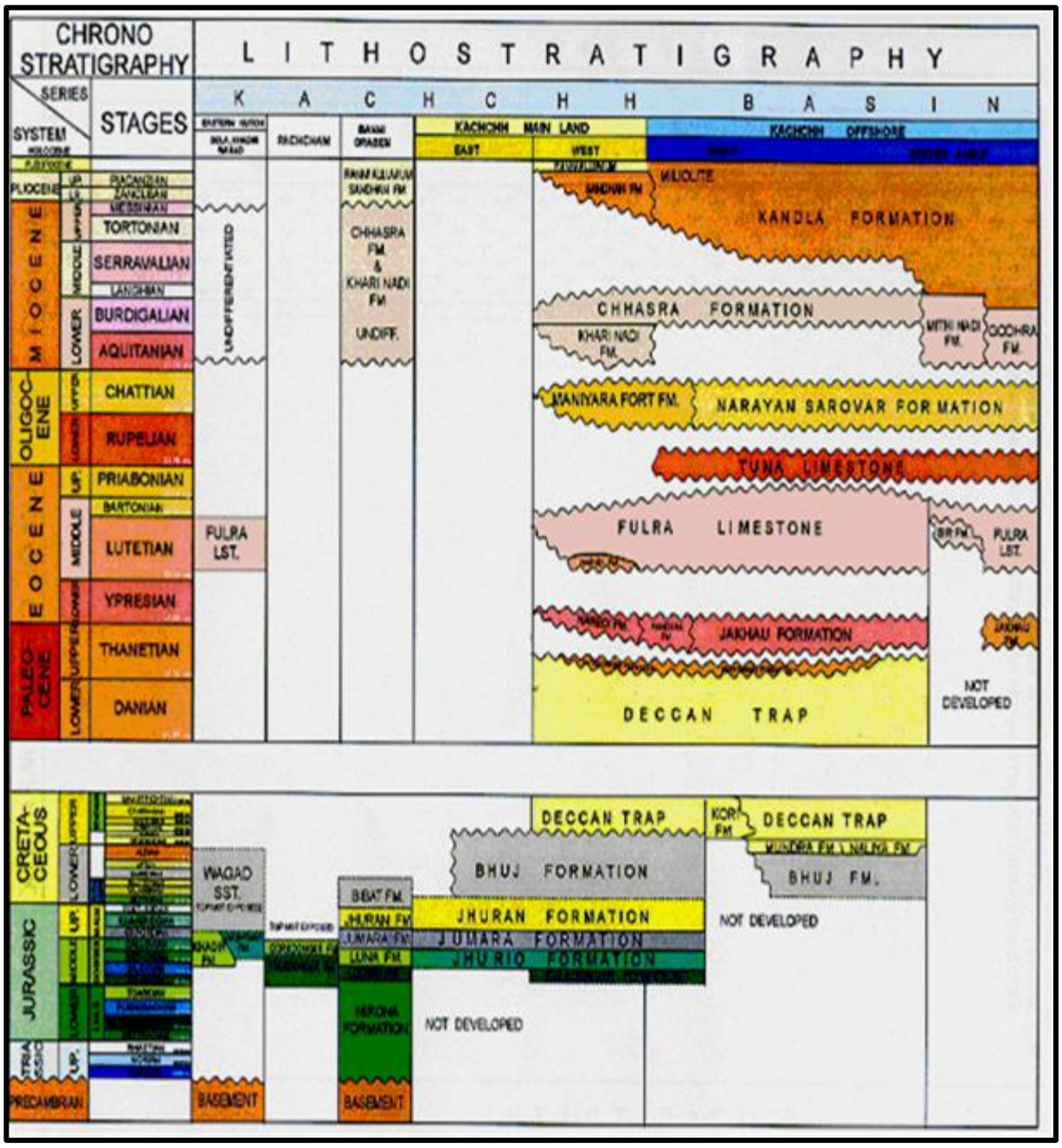
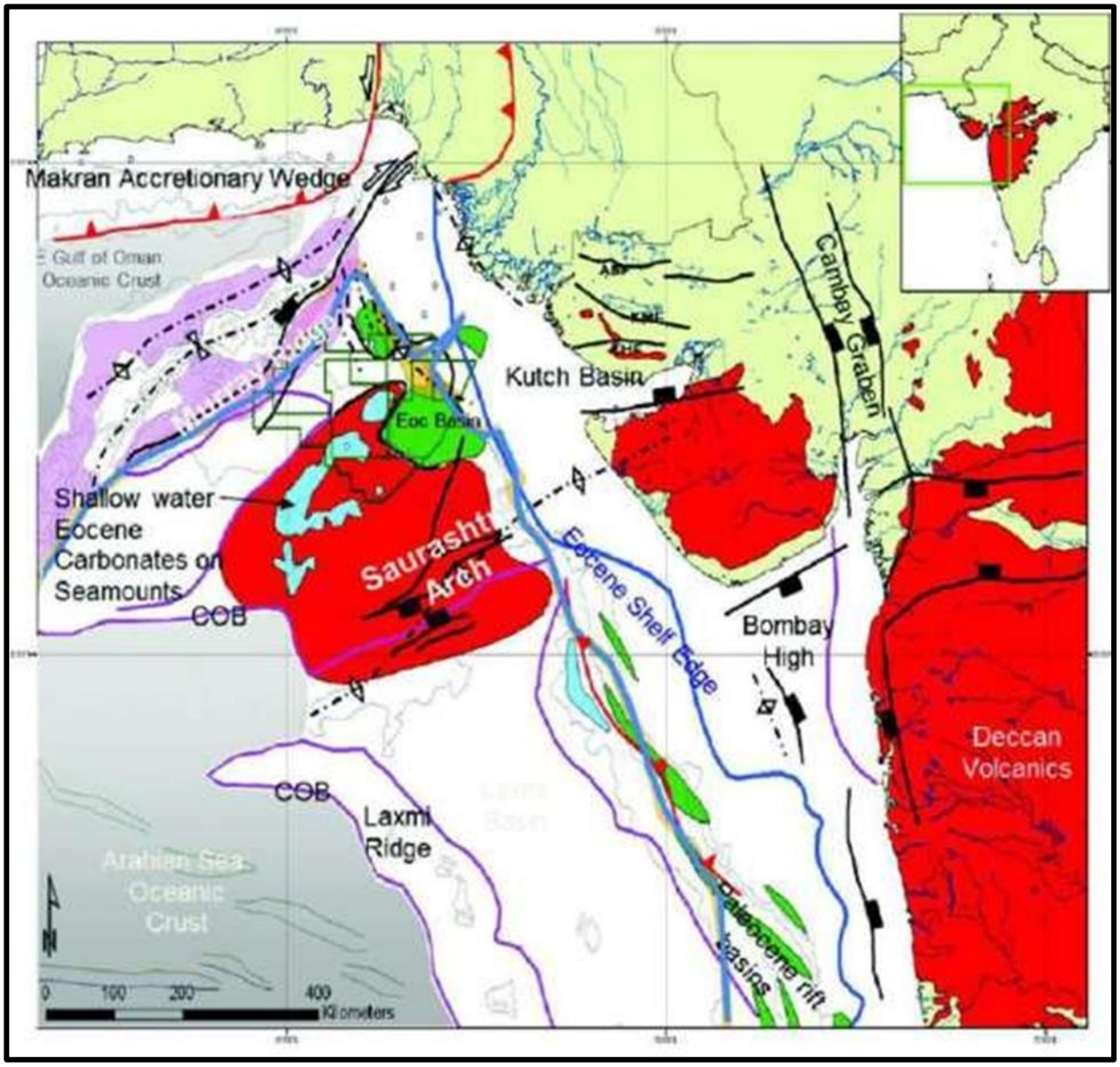


Figure 3-5: Tectonic map of the Kutch – Saurashtra basin



4. DISCOVERY AND FIELD DESCRIPTION

The information docket is presented in a manner that each oil/gas discovery (i.e. the field) is described along with other wells, drilled and/or tested in the contract area. The available information of geo-scientific and engineering findings, studies and interpretations are sequentially showcased and in process, all subsurface and surface data from drilling, logging, testing and production data have been collated. Reservoir studies wherever available have been described with facts. Geological interpretations are suitably illustrated through correlations, sections and maps to bring in subsurface picture of the contract area. In the end, discovered hydrocarbon in-place and its recoverable contingent resources, wherever available have been given with parameters and range of estimates.

For the sake of continuity in reading domain contents like drilling, logging, testing, reservoir studies and geology, each field is described domain-wise into comprehensive illustration of all constituent wells and reservoirs in one go. For example, when a contract area has more than one discovery/field, each such discovery/field starts with a new page describing key information pertaining to drilling, logging, testing and other subsurface details.

Emphasis is given on factual presentation of data and available information on interpretations and results. Figures and pictures are extensively used for illustrations to establish a preliminary basis for field understanding and contents of data. As outlined under disclaimer, all information, contained in this report is made available by NOCs and Contractors through their specific submissions.

In this GK/OSDSF/GKOSN/2025 contract area (fields-on-offer in Figure 3-2 and Figure 3-3), there are 7 discoveries, which are spread over three polygons as given below:

Sl. No	Polygon	Discoveries	(O+OEG) MMTOE	O+OEG (MMTOE) (As per Erstwhile Operator)	O+OEG (MMTOE) (As per Erstwhile Operator DoC)
1	GK-1	GKS092NAA-1	0.017	0.02	0.021
2	GKOSN	GKS091NDA-1, GKS091NFA-1 GKS101NAA-1, GKS101NCA-1	14.49	12.56	12.25
3	GSOSN	GSS041NAA-1, GSS04NAA-2	16.48	17.3	14.69
Total			**30.99**	**29.88**	**26.97**

In the following chapters, details of all three Polygons have been discussed for all the seven discoveries

GK/OSDSF/GKOSN/2025 GKS092NAA-1 FIELD

4.1 DESCRIPTION OF KUTCH OFFSHORE- GKS092NAA-1(GK-1 Polygon)

Well GKS092NAA-1 was drilled in 2014 with the objective to explore the hydrocarbon potential of Miocene, Eocene, Paleocene, Cretaceous and Jurassic sequences in NELP-VII block GK-OSN-2009/2 in Kutch - Saurashtra basin. This location is a structural prospect (trap door closure) bounded on the East and South by reactivated reverse faults. This structural closure is a result of transgressive forces imparted during Early Eocene and beyond which inverted both Tertiary & Mesozoic sections along the NW-SE trending reverse faults.

The well is located in the southwestern portion of the Kutch - Saurashtra in the earlier NELP block GK-OSN-2009/2 in the Kutch shallow water. The well is situated ~11 km west of well GK-29A-1 and ~22 km NE of GK-3-1 in a separate NW-SE trending fault block. The identified prospect was a trap door closure bounded in the east and south by reactivated reverse faults. This structural closure is a result of transgressive forces imparted during Early Eocene and beyond which inverted both Tertiary & Mesozoic sections along the NW-SE trending reverse faults.

Well GK-22C-1, which is located in the Northwest of the present well GKS092NAA-1 in separate fault block, flowed gas @ 2,80,000 m3/day through 40/64” Choke from Early Cretaceous Bhuj Sandstone; whereas the wells in GK-28 area (GK-28-1, GK-28-3, GK-28-6 and GK-28-7) located in the south, had gas discoveries from Tertiary Formations (Middle Miocene, Early Eocene and Paleocene) & well GK-28-2 flowed Oil from sandstones of Cretaceous age. Well, GK-29A-1, situated in the east of the present well, flowed gas from sandstones of Paleocene age. Seismic attribute studies revealed the presence of channel features which in turn points to the presence of clastics in the area.

The cluster GK-28 & 42 has been awarded under DSF-III and is currently under development. There are gas discoveries in the nearby NELP blocks GK-OSN-2009/1, GK-OSN-2010/1 & GS-OSN-2004/1, which are also part of GK/OSDSF/GKOSN/2025 Block.

4.1.1 Drilling and Well completion: GKS092NAA-1

In the Polygon GK-1, only one well GKS092NAA-1 has been drilled & Key information of the well has been collated and presented hereunder. This includes the Well Construction Diagram (Figure 4-1) and the Litho-column Information (Figure 4-2).

Figure 4-1: Well profile of GKS092NAA-1

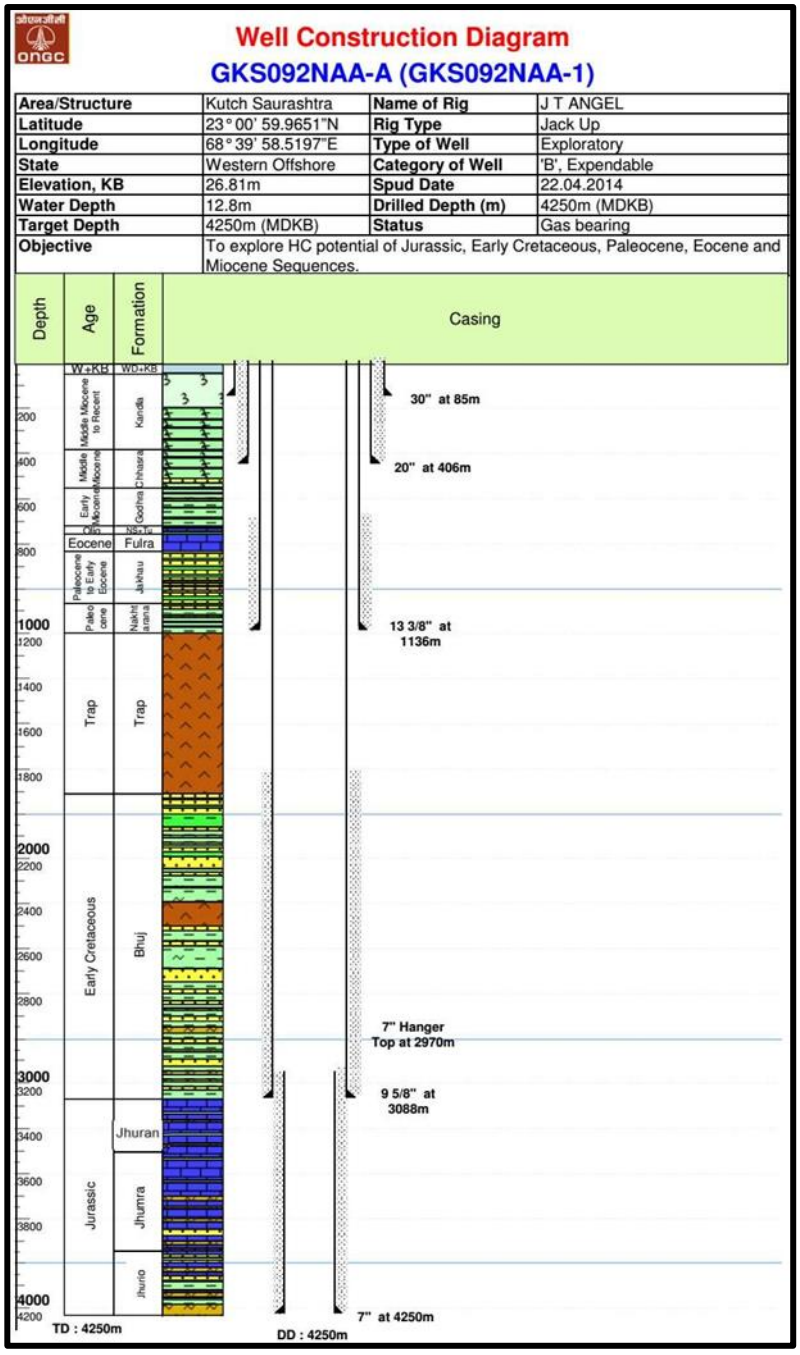
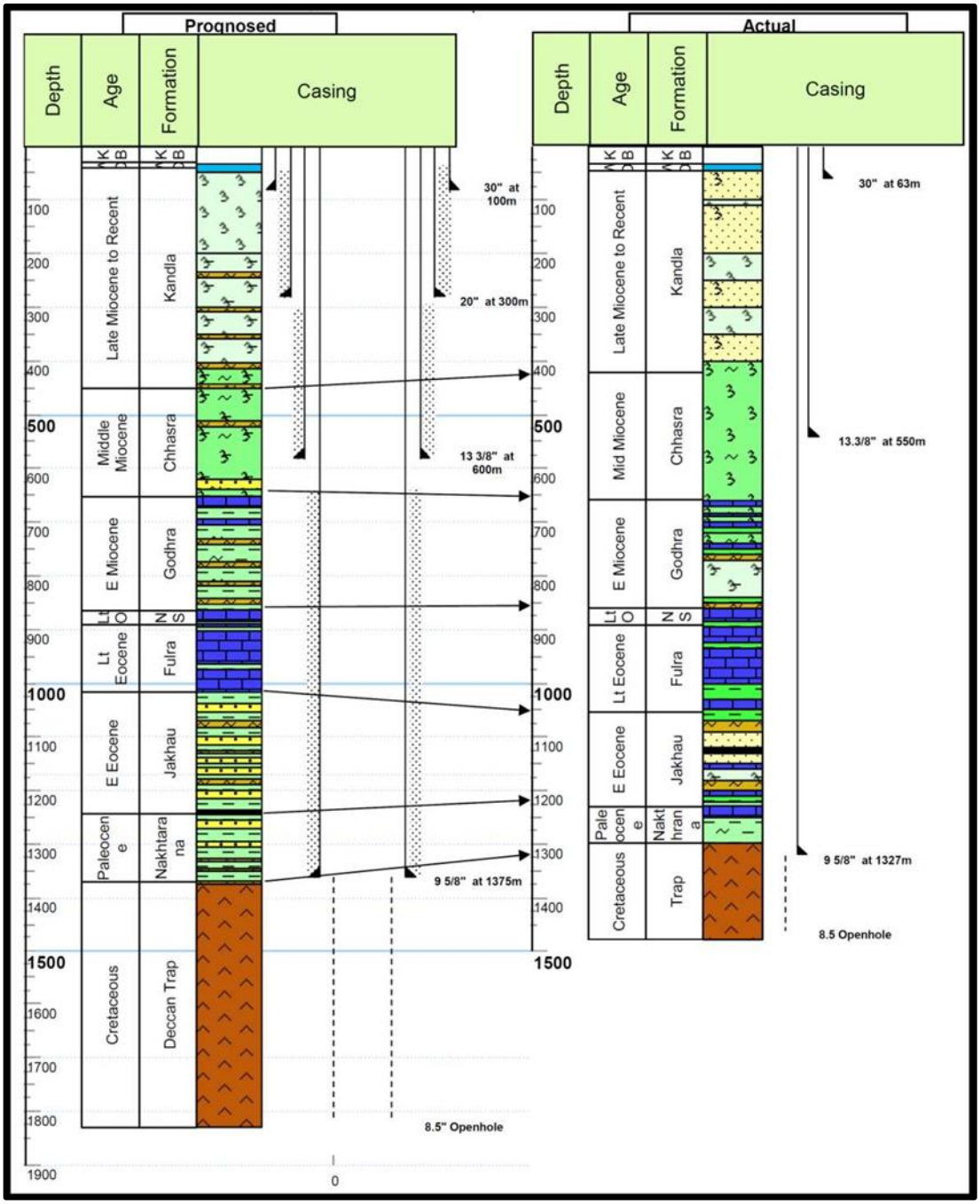


Figure 4-2: Litho-section information of GKS092NAA-1



4.1.2 Well logging and formation evaluation

The well logs of the discovery well (GKS092NAA-1) in the contract area have been reviewed. The logs recorded in various open-hole sections along with cased-hole logs and information of conventional and other wireline formation test data are presented in this docket. The availability of key input reports like Well Completion Reports (WCR) and Formation Evaluation Report (FER) have been checked and information given. Reservoir parameters of interesting zones and results of the tested zone(s) have been included in this report. Log motifs of tested/ interesting zone of key wells are also appended (Figure 4-3).

A). Well completion and log evaluation reports availability (GKS092NAA-1):

WCR/FER Availability	Spud Date	KB	Drilled Depth/Water Depth
WCR/FER available	22.04.2014	26.81	4250m /12.8m

B). Well logs acquired (GKS092NAA-1)

Sl No	Hole/ Casing Size (")	Date	Interval (m)	Logs recorded	Remarks
1	12 ¼" Pilot Hole	04.05.14 05.05.14	1124 - 407	PEX-AIT-HNGS (1st run) Sonic scanner - PPC -GPIT (2nd run)	Max Temp :170oF
		08.05.14 - 10.05.14		MDT	63 Pre-tests were attempted. Collected 1 gas sample and 2 water samples.
		11.05.14		MSCT	Attempted:50, Recovered:13
		12.05.14		VSP	
2	12 ¼	13.06.14	2249-1137.5	AIT-PEX-HNGS	Intermediate logging
		13.06.14 - 20.06.14	2249-1137.5	MDT	67 Pre-tests attempted. 10 liquid samples were collected which were analyzed to be water and base oil of SOBM
		20.06.14 - 2.06.14	2249-1137.5	SWC	SWC tool failure. Called off SWC programme
		17.07.14	3117 -2149	AIT-PEX-HNGS	Max recorded temperature 250°F
		18.07.14	3111 -2150	SS-GR	Max recorded temperature 256°F
		22.07.14	2325 -1840	OBMI+UBI	
		22.07.14	3110 -1137	MSCT/CST	SWC were attempted at 14points.
		22.07.14	1130 -825	USIT-CBL-VDL-GR-CCL	
		24.07.14 - 25.07.14	3118-2617	MDT	Total test: 55, Good:16, Tight: 12, Lost seal:27
		26.07.14 - 27.07.14		MSCT	SWC were taken un the interval 2970m to 1832m.
		27.07.14 - 29.07.14	2837.9- 1913.5	MDT	MDT by Saturn tool. 17 Pre- tests were attempted.

4	8 ½"	1.10.14	4260-3000	HNGS-AIT	
			4260-3050	LDT-CNT-NGT	
		2.10.14	4058 -2984	MDT-PQ	C/out pretests at 40 points, all are tight/no seal
		5.10.14	4250-3088	SONIC-SCANNER OBMI	
			4250-3088	ECS-ILE	
		6.10.14	4250-3088	HNGS-TLD-EDTC	
		7.10.14	4234.5-3164.5	MSCT	Attempted 30 SWC, Recovered 24, accepted : 18, Rejected : 6
		8.10.14		VSP	

C| Well log evaluation and initial test results (GKS092NAA-1):

Interval (mMDRT/mTVDSS)	Formation (Zone, if specified)	Gross (m)	Net(m)	Phi	Sw
3945-4250 / 3918-4223	Jhurio (4055-4065 mMDRT) Initial testing results: Flowed water	10.0	0.0	0.02-0.12	1
	Jhurio (4025-4040 mMDRT) Initial testing results: Flowed water	15.0	0.0	0.08-0.12	1
	Jhurio (3995-4002 mMDRT) Initial testing results: Flowed water	7.0	0.0	0-0.1	1
	Jhurio (3989-3992 mMDRT) Initial testing results: Flowed water	3.0	0.0	0-0.1	1
881-1039 / 854-1012	Jakhau (898-900 mMDRT) Initial testing Result: Flowed Gas	2.0	2.0	0.29	0.4

Two objects have been tested in this well.

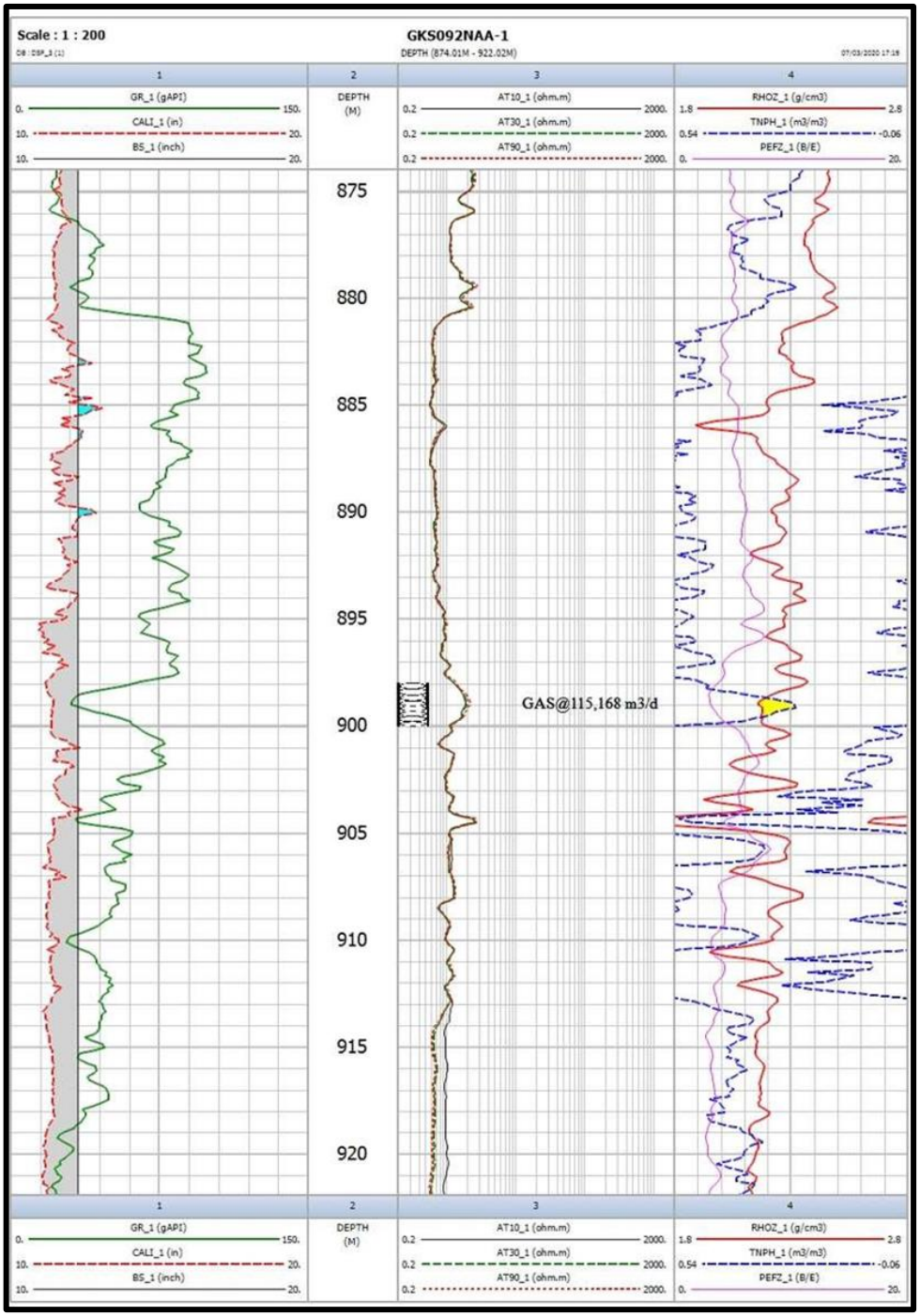
Object-I (3989-3992m, 3995-4002m, 4025-4040m, 4055-4065m, 4074-4080m), Jhurio Formation

Well was tested through TCP-DST and well flowed little water with FTHP ranging between 0 to 20 psi with Salinity of 42000 ppm to 50000 ppm.

Object-II (898-900m), Jakhau Formation

Well flowed Gas @115,168 m3/day through 32/64 " choke at FTHP 730psi and Gas @ 82346 m3/day through 24/64" Choke at FTHP of 1020 psi.

Figure 4-3: Well log motif of GKS092NAA-1



4.1.3 Well testing and workover history

Two objects were tested in this well. Object-I tested in the intervals 3989-3992m, 3995-4002m, 4025-4040m, 4055-4065m & 4074-4080m in Jhurio formation flowed formation water with salinity ranging from 40,000 to 50,000ppm as Cl. Object-II tested in the interval 898-900m in Jakhau Sandstone flowed gas @115168 m3/day through ½" choke at FTHP 730psi.

Table 4-1: GKS092NAA-1 well testing results for Object-I in Jhurio and Object-II Jakhau formations

Formation	Object	Interval (m)	Bean (1/64")	FTHP (psi)	Qgas (m3/day)	FTHT (oF)	Remarks
Jhurio	I	3989-3992, 3995-4002, 4025-4040, 4055-4065, 4074-4080	1/8	0-20	Nil		Pressure surging was carried out @ 5700 psi (max) in stages. No activity
Jakhau	II	898-900	16	1100	45581	76	
			8	1160	9548	80	
			32	780	123122	93	
			8	1220	9683	76	
			16	1180	45743	78	
			24	1020	82346	92	
			32	730	115168	98	

4.1.4 Reservoir Engineering studies and analysis

Key reservoir engineering datasets, wherever available have been collated and presented under various data genres. In a comprehensive data presentation, the results are included from well tests, formation dynamics tests, reservoir pressure build-up study and PVT data/ results.

4.1.4.1 Formation dynamics tests (GKS092NAA-1)

Thirty-four intervals were identified for MDT sampling and pretests in 12 ¼" pilot hole. Three samples were collected. The details are presented in Table 4-2.

Table 4-2: GKS092NAA-1 – MDT sampling and pretests in 12 ¼" pilot hole, Run-I

MDT samples conducted in 12 ½ " hole, Run-1

Test No.	MD (m)	Mud Hydrostatic Pressure (psi) before	Mud Hydrostatic Pressure (psi) after	Formation Pressure (psi)	Temp (°F)	Draw down Mobility (md/cp)	Remarks
1	898.8	1626.592	1625.648	1315.26	152.3	56	1 MPSR (PVT) sample collected – gas. 1 MRSC sample collected - gas.
2	1053.0	1901.8	1901.5		152.0		
3	1052.5	1900.4	1900.7		151.9		
4	1052.0	1899.6	1899.6		152.0		
5	1051.5	1898.8	1898.6		152.1		
6	1054.0	1903.8	1903.4		152.2		
7	1050.5	1896.7	1896.4		152.5		
8	1046.3	1889.2	1889.4		152.7		
9	1046.0	1888.8	1888.9		152.9		
10	986.8	1783.4	1783.5		152.9		
11	986.5	1782.9	1782.9		152.7		
12	987.1	1784.2	1784.1		152.5		
13	987.5	1785.1	1785.0		152.4		
14	954.0	1724.7	1724.5	1388.8	152.2	324.39	
15	954.7	1726.2	1726.2	1389.88	151.0	79.09	FID – water
16	954.7	1726.1	1726.2	1389.88	150.9	242.38	FID - water
17	923.6	1670.0	1670.2	1345.81	150.2	149.17	1 MRSC sample collected - water
18	910.1	1645.6	1645.7	1327.46	152.3	25.73	FID - water
19	859.5	1555.3	1555.6		151.8		
20	859.0	1554.5	1554.7		151.3		
21	858.7	1554.0	1554.2		150.9		
22	860.4	1557.1	1557.2		150.4		
23	861.0	1558.3	1558.5		149.9		
24	862.5	1560.9	1560.9		149.4		

25	833.0	1507.9	1508.3		149.1		
26	833.8	1509.6	1509.8		148.6		
27	834.2	1510.3	1510.2		148.0		
28	838.0	1517.4	1517.3		147.5		
29	839.8	1520.5	1520.3		147.2		
30	779.0	1411.0	1411.1		146.4		
31	779.8	1412.7	1412.9		145.5		
32	778.0	1409.3	1409.5		145.5		
33	783.0	1418.7	1418.5		144.9		
34	784.0	1420.3	1420.3		144.3		

Twenty-nine intervals were identified for MDT sampling and pretests in 12 ¼" pilot hole. Three samples were collected. The details for run-II are presented in Table 4-3.

Table 4-3: GKS092NAA-1 – MDT sampling and pretests in 12 ¼" pilot hole, run-II

Test No.	MD (m)	Mud Hydrostatic Pressure (psi) before	Mud Hydrostatic Pressure (psi) after	Formation Pressure (psi)	Temp (°F)	Draw down Mobility (md/cp)	Remarks
1	779.0	1410.301	1410.491		136.1		
2	779.8	1413.0	1411.9		136.8		
3	783.9	1420.7	1419.3		137.2		
4	750.0	1358.9	1358.8		137.7		
5	749.5	1358.0	1357.9		137.7		
6	749.7	1358.5	1358.2		138.1		
7	743.0	1345.8	1345.2		138.4		
8	743.5	1346.4	1345.7		138.6		
9	742.5	1344.4	1345.1		138.4		
10	742.0	1343.9	1343.1		138.7		
11	726.7	1315.7	1315.7		138.4		
12	726.0	1314.5	1315.3	1066.09	137.6	0.16	could not pump
13	727.5	1318.2	1318.1		137.8		
14	727.2	1317.5	1317.5	1070.54	138.0	0.08	could not pump
15	681.1	1233.7	1233.0	973.59	133.1	1913.2	Water sample drained at wellsite
16	658.5	1192.1	1192.2	946.58	133.8	2.43	could not pump
17	659.2	1193.5	1193.5	954.51	133.9	0.53	could not pump
18	630.0	1140.9	1141.1	904.63	133.4	4.23	could not pump
19	629.5	1140.1	1140.1	905.17	132.8	9.1	could not pump
20	616.7	1116.9	1116.9	883.92	131.4	23.59	FID water - lost seal while pumping
21	616.5	1116.7	1116.8	883.15	132.0	16.69	could not pump
22	617.0	1117.5	1117.6	883.90	131.4	21.22	FID water - lost seal while pumping

23	617.5	1118.3	1118.3	884.64	130.9	62.63	FID water - lost seal while pumping
24	617.7	1118.4	1118.3	1047.37	131.5	441.34	FID water - lost seal while pumping
25	604.2	1094.857	1093.577	866.05	128.9	105.96	FID - water
26	529.5	959.0	959.2		128.4		
27	530.0	960.0	960.1		127.9		Tight pretests taken - then lost seal
28	531.0	961.9	961.8		127.4		Tight/low mobility - could not pump
29	532.0	963.6	963.6		127.2		Tight/low mobility

MDT samples were collected at 898.8m (Gas Sample), 923.6m and 681.1m (Both water samples). Details are presented in Table 4-4.

Table 4-4: GKS092NAA-1 – MDT samples summary

Depth (m)	Sample Description / Color / Volume	Sample Salinity (ppm as NaCl)	Sea/salt water salinity (ppm as NaCl)	Sample Resistivity (Ω-m)	pH	Chamber Opening Pressure (psi)	No. of samples	Remarks
923.6	Water/ Light brown color/ 10.5L	59400	-	0.83 Ohm.m @88°F	7	0	1	Sample drained at Wellsite
898.83	Gas/ Colorless/ Odorless/ 54.1cf	-	125400	-	-	3100	2	Collected 2 gas samples, one sample drained at rig, another in SCHL MPSR bottle.
681.1	Water/ Buff colour/ 10.5L	19800		0.91 Ohm.m @88°F	7	800	1	Sample drained at Wellsite

MDT was carried out during intermediate logging of 12 ¼" hole at 2257m. 67 pretest were carried out. The details are presented in Table 4-5.

Table 4-5: GKS092NAA-1 – MDT in 12 ¼" hole at 2257m

Test No	MD (m)	Mud Hydrostatic Pressure (psi) before	Mud Hydrostatic Pressure (psi) after	Formation Pressure (psi)	Temp (°F)	Draw down Mobility (md/cp)	Remarks
1	1913.5	3250.04	3251.14	2818.45	222.2	14.5	Sample collected in MRSC
2	1927.5	3274.72	3275.34	--	222.2	--	

3	1927.2	3274.19	3275.4	2844.53	223.3	5.9	Mobility too low to attempt pumping.
4	1929	3277.53	3278.3	--	223.3	--	
5	1928.8	3277.8	3277.91	2842.91	225.9	8.4	Sample collected in MPSR
6	1958	3351.45	3351.13	--	178.9	--	
7	1957	3349.82	3349.48	2901.48	184.4	1.2	
8	1957.5	3350.51	3350.34	2894.14	190.6	1.73	
9	1957.7	3350.64	3350.62	--	195.0	--	
10	1957.2	3349.74	3349.87	--	198.2	--	
11	1958.1	3351.41	3352.15	2892.81	224.9	2.7	Sample collected in SC
12	2183	3735.94	3735.06	3220.15	236.0	8.2	Sample collected in SC
13	2229.5	3826.12	3811.95	3308.07	242.3	8.3	Sample collected in SC
14	2218.5	3792.52	3792.86	3274.62	243.6	4.2	Sample collected in MPSR
15	2226.5	3809.95	3806.42	3285.45	243.1	16.7	
16	2224.5	3802.54	3802.9	3286.02	242.7	3.9	
17	2221.5	3797.31	3798.13	3283.69	242.8	2.3	
18	2208.5	3775.65	3776.71	--	242.6	--	
19	2191.5	3747.11	3747.87	--	241.5	--	
20	2187	3737.45	3739.56	3225.8	240.2	28.1	
21	2212	3788.6	3782.2	--	239.9	--	
22	2214	3785.63	3785.65	--	239.7	--	
23	2195.8	3753.29	3754.58	--	239.7	--	
24	2196	3756.59	3755.18	--	239.5	--	
25	2180.5	3727.64	3728.77	3216.03	239.3	42.9	
26	2177.2	3722.53	3723.39	--	239.2	--	
27	2177.4	3722.9	3723.4	--	238.3	--	
28	2177	3723.61	3723.43	--	238.0	--	
29	2173	3715.58	3716.13	--	237.9	--	
30	2148.5	3672.94	3673.28	3165.04	237.4	36.9	Sample collected in MPSR
31	2094.5	3581.6	3583.49	--	232.2	--	
32	2094.3	3581.75	3580.48	3081.86	233.6	30.4	Sample collected in SC
33	2098	3586.03	3587.15	3088.11	233.8	82	
34	2092	3575.96	3577.13	3079.36	234.0	21.6	
35	2090.5	3574.15	3575	3078.03	234.4	6.7	
36	2086	3566.24	3567.41	3070.39	234.6	47.9	
37	2083	3561.42	3562.01	3065.97	234.7	153.6	
38	2080	3556.53	3557.39	3061.46	229.7	138.8	

39	2077	3551.38	3552.31	3057.15	234.8	23.1	
40	2074	3546.42	3547.28	3052.56	234.6	356.7	
41	2071	3541.14	3542.02	3048.23	234.5	116.1	
42	2066.5	3533.21	3534.46	3041.55	234.3	236.9	
43	2063	3527.5	3528.38	3036.56	234.1	498.2	
44	2062	3526	3526.4	3035.34	233.8	30.5	
45	2057.5	3518.66	3518.62	--	233.5	--	
46	2054.5	3513.34	3513.43	3036.85	233.3	0.72	
47	1952.5	3338.81	3340.9	--	231.2	--	
48	1950.5	3337.09	3337.5	2287.48	229.3	5.5	
49	1949	3333.81	3334.72	2869.79	229.1	5.3	
50	1946	3329.2	3329.95	2866.24	228.9	27.2	
51	1941.5	3321.1	3321.62	2860.86	228.5	4.1	
52	1940	3318.75	3319.54	--	228.3	--	
53	1933.7	3307.81	3309.06	--	227.9	--	
54	1935	3310.12	3311.04	--	227.3	--	
55	1930.6	3302.58	3303.56	2847.28	227.1	1.4	
56	1933.5	3308.73	3308.25	--	226.8	--	
57	1921.58	3283.69	3283.22	2833.36	219.28	3.46	Sample in SC
58	1933.53	3305.54	3303.60	--	219.09	--	
59	1934.97	3305.32	3305.93	2850.11	224.86	40.68	Sample in SC
60	1966.81	3361.91	3359.95	2908.20	223.73	2.75	Too low to continue pumping
61	1967.01	3359.44	3360.11	2904.18	223.06	2.99	Too low to continue pumping
62	1990.41	3398.51	3399.76	--	222.33	--	
63	1990.5	3399.85	3400.12	--	221.94	--	
64	1990.59	3400.08	3400.26	--	221.69	--	
65	1992	3402.15	3404.89	2932.36	222.89	40.6	FID
66	2059.99	3518.28	3517.55	3032.67	230.33	2.82	FID
67	1946.5	3323.15	3324.23	2868.09	229.24	10.73	FID

10 MDT samples were collected during the intermediate logging of 12 ¼" hole. The details are presented in Table 4-6.

Table 4-6: GKS092NAA-1 – summary of MDT sampling in 12 ¼" hole

ample No.	epth (m)	Sample volume	Color/ Fluid	Sample salinity (ppm as NaCl)	Sal of mud during drilling (ppm as NaCl)	Sal of mud filtrate during drilling (Water phase salinity) salinity ppm as NaCl)	Sample Resistivity (ohm's @ °F)	pH	Remarks

01	1913.5	7.5 liter	Colourless Water-75%/ Dark brownish fluid-25% appx	1,15,000	69,300	255750	1.32 @ 92.3	6	No HC smell. The dark brownish fluid of sample shows yellow fluorescence, which is slightly different from the milky white fluorescence shown by the base oil filtrate
02	1928.8	385ml	Colourless Water-98%/Thin layer of brownish fluid-2%appx)	1,20,000	69,300	255750	1.42 @ 91.0	6	No HC smell. The brownish fluid layer of the sample shows yellow fluorescence which is slightly different from the milky white fluorescence shown by the base oil filtrate
03	1958.1	10 liter	Pale yellow fluid-60%/ Colorless Water-40% approx	1,18,800	69,300	255750	1.089 @ 80.8	6	No HC smell. The pale-yellow fluid part of the sample shows milky white fluorescence, similar to the fluorescence shown by the base oil filtrate of SOBM.
04	2183	10 liter	Pale brown fluid-50%/ Colorless Water-50% approx	1,28,700	69,300	255750	1.063 @ 81.4	6	As above
05	2094.3	10 liter	Pale yellow fluid-25% / Colorless Water-75% approx	1,23,750	69300	255750	1.127 @ 79.8	6.5	No HC smell. The pale-yellow fluid part of the sample shows milky white fluorescence, which is similar to the fluorescence shown by the base oil filtrate of SOBM.
06	2148.5	420 cc	Pale yellow fluid-20%/ Colorless Water-80% approx	1,28,700	69300	255750	1.106 @ 80.5	6.5	No HC smell. Pale yellow fluid shows milky white fluorescence, similar to the fluorescence shown by the base oil filtrate of SOBM.

07	2218.5	420 cc	Thin layer of pale yellow fluid-05%/ Colorless Water-95% approx	1,35,300	69300	255750	1.043 @ 81.6	6	No HC smell. The pale-yellow fluid part of the sample shows milky white fluorescence, which is similar to the fluorescence shown by the base oil filtrate of SOBM.
08	2229.5	07 liter	Pale yellow fluid-15%/ Colorless Water-85% approx	1,35,300	69300	255750	1.08 @ 81.1	6	No HC smell. Pale yellow fluid part of sample shows milky white fluorescence, which is similar to the fluorescence shown by the base oil filtrate of SOBM.
09	1935	10 liter	Pale yellow fluid similar to base oil filtrate of SOBM-45% / Colorless Water-55% approx	115500	69300	255750	0.984 @ 79.8	6.5	No HC smell. The pale-yellow fluid part of the sample shows milky white fluorescence, which is similar to the fluorescence shown by the base oil filtrate of SOBM.
10	1921.6	10 liter	Pale yellow fluid similar to base oil filtrate of SOBM 15%/ Colorless Water-85% approx	113850	69300	255750	0.97 @ 80.5	6.5	No HC smell. The pale-yellow fluid part of the sample shows milky white fluorescence, which is similar to the fluorescence shown by the base oil filtrate of SOBM.

MDT samples at 12 ¼" phase TD (Saturn MDT tool)

The MDT sample collected by Saturn tool at 1913.5m is similar to the earlier MDT sample collected at the same depth (base oil of SOBM) are presented in Table 4-7.

Table 4-7: MDT samples at 12 ¼" phase TD (Saturn MDT tool)

Sample No.	Depth (m)	Sample volume	Colour/ Fluid	Sample salinity (ppm as NaCl)	Salinity of mud filtrate during drilling (ppm as NaCl) WPS	Sample Resistivity (ohm's @ °F)	pH	Remarks
01	1913.5	10 liter	Colorless (Water-60%)/ Dark brownish liquid (40% approx.)	1,18,800 66000	2,64,000	0.92@74.4 0.89@71	6.5	Collected sample at 0945hrs on 29.07.14

02	2761.3	330 ml	Dirty white liquid (20%)/ Pale yellow liquid (80%)	36,300 693	2,64,000	0.82 @ 94.0 107 @ 94.0	7	Collected sample at 1015hrs on 29.07.14

MDT pretest was carried out in 8 ½" hole at 40 points. The details are presented in Table 4-8.

Table 4-8: MDT in 8 ½" phase

Sl No	Depth (m)	Temp Deg F	Mud Pres. Before (psi)	Mud Pres After(psi)	Formation Pres. (psi)	DD Mobility mD/cP	Pretest Status
1	2984.01	261.03	6741.277	6739.883	N/A	N/A	Tight Test
2	4031.02	321.26	9063.382	9063.154	N/A	N/A	Lost Seal
3	4031.49	323	9061.753	9067.142	N/A	N/A	Lost Seal
4	4032.19	323.92	9066.72	9070.054	N/A	N/A	Lost Seal
5	4034.71	325.7	9073.306	9077.759	N/A	N/A	Lost Seal
6	4031.99	326.28	9067.163	9070.93	N/A	N/A	Lost Seal
7	3062.99	293.19	6888.936	6897.456	N/A	N/A	Tight Test
8	4034.5	310.37	9077.714	9079.38	N/A	N/A	Lost Seal
9	4034.4	319.84	9077.055	9081.155	N/A	N/A	Lost Seal
10	4059.99	324.85	9125.946	9122.484	N/A	N/A	Lost Seal
11	4057.7	326.6	9123.516	9126.85	N/A	N/A	Lost Seal
12	3039.44	255.95	6885.539	6882.159	N/A	N/A	Tight Test
13	4031.7	328.09	9045.97	9051.445	N/A	N/A	Lost Seal
14	4033.91	329	9059.052	9061.785	N/A	N/A	Lost Seal
15	4047.99	329.54	9095.766	9097.558	N/A	N/A	Tight Test
16	4131.2	337.68	9265.887	9272.345	N/A	N/A	No Seal
17	4130.45	338.29	9269.424	9274.974	N/A	N/A	Lost Seal
18	4132.21	338.9	9275.169	9278.967	N/A	N/A	Lost Seal
19	4141.49	339.92	9303.989	9308.19	N/A	N/A	Lost Seal
20	4141.81	340.68	9305.562	9308.679	N/A	N/A	Tight Test
21	4149.48	341.04	9326.968	9328.238	N/A	N/A	No Seal
22	4149.21	341.43	9323.272	9327.099	N/A	N/A	Tight Test
23	4161.37	341.54	9354.738	9356.646	N/A	N/A	Lost Seal
24	4162.02	341.86	9358.41	9359.651	N/A	N/A	No Seal
25	4165.4	342.63	9367.986	9368.631	N/A	N/A	No Seal
26	4170.72	343.42	9380.979	9382.488	N/A	N/A	Tight Test
27	4174.05	343.56	9385.478	9388.224	N/A	N/A	Tight Test
28	4174.67	343.65	9387.078	9389.681	N/A	N/A	Tight Test
29	4176.85	344.02	9387.023	9389.268	N/A	N/A	Tight Test
30	4191	343.99	9426.876	9429.686	N/A	N/A	No Seal
31	4192.49	345	9429.853	9431.659	N/A	N/A	Tight Test
32	4194.78	346.05	9434.574	9437.049	N/A	N/A	Tight Test
33	4201.71	345.52	9450.299	9450.893	N/A	N/A	Lost Seal
34	4007.6	338.29	8978.864	8990.165	N/A	N/A	Lost Seal
35	4007.99	336.58	8991.384	9002.913	N/A	N/A	Lost Seal
36	3880.12	321.43	8743.033	8742.766	N/A	N/A	No Seal
37	3879.99	321.58	8741.159	8741.737	N/A	N/A	No Seal
38	4007.02	327.57	9025.73	9024.186	N/A	N/A	Lost Seal
39	4057.01	330.85	9137.564	9135.749	N/A	N/A	Lost Seal
40	4058.01	334	9135.678	9136.776	N/A	N/A	Tight Test

4.1.4.2 Pressure Build-up study (GKS092NAA-1)

Testing of Object-II (Jakhau Formation) was carried out in Interval 898-900m & Pressure Transient study was carried out (Figure 4-4 and Figure 4-5). Reservoir Study Interpretation report is available.

The brief results of Pressure Build up studies are (refer to Table 4-9):

Initial pressure	: 1305.6 psi
Permeability	: 692.2 md
Capacity (kh)	: 4087.9 mdft
Absolute Open Flow Potential (gas)	: 6.752836 MMSCFD (0.19 MMSCMD)

Figure 4-4: GKS092NAA-1 Pressure Build-up Plot (Obj-II)

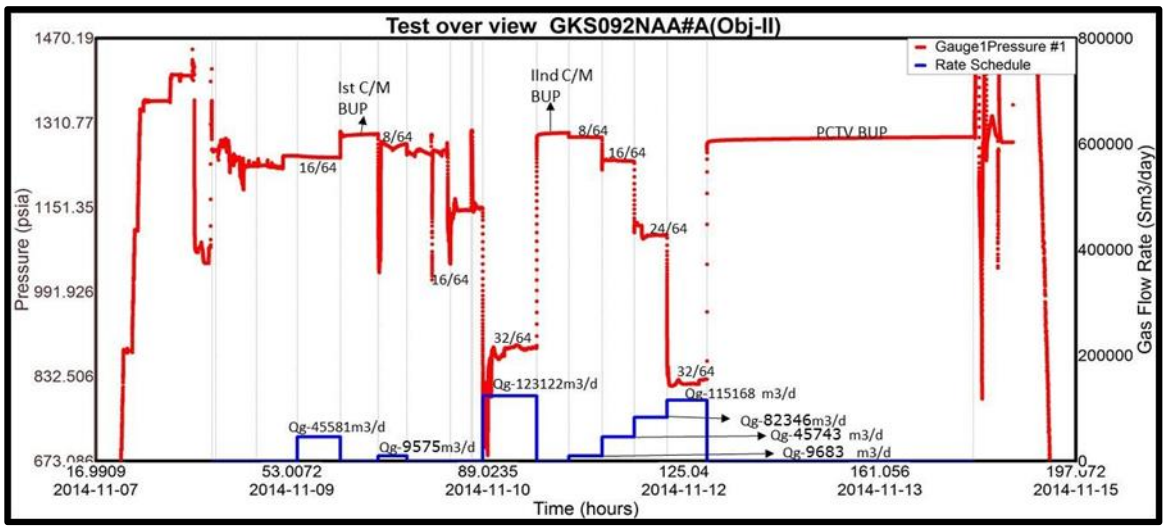


Figure 4-5: GKS092NAA-1 TCP-DST Sandface C&N plot (Obj-II)

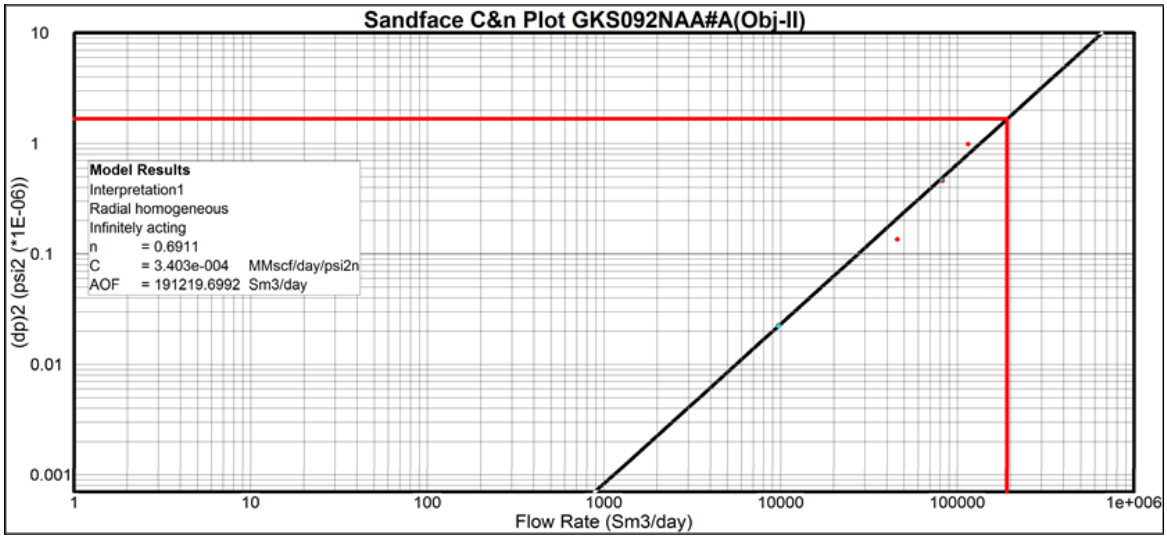


Table 4-9: GKS092NAA-1 TCP-DST interpretation

Reservoir parameters	Value
Permeability (md)	692.2280
Permeability-thickness (md.ft)	4087.959
Skin factor	76.267
Mobility ratio	1.740
Rate dependent skin coefficient (D) (1/(Mscf/day))	2.817e-5
AOFP, m3/day	191219

4.1.4.3 PVT (GKS092NAA-1) - Object: II

Gas expansion factor : 0.0131 v/v
Gas specific gravity : 0.642|
Gas compressibility : 0.0008069 1/psi.

4.1.4.4 Gas composition analysis (GKS092NAA-1)

Table 4-10: GKS092NAA-1 Gas composition

Date &Time (Hrs)	Sample source	Choke Size (")	TG (%)	C1 %	C2%	C3%	iC4 %	nC4 %	iC5 %	nC5 %
08.11.14 (1645)	C/Manifold	1/4	50.15	43.72	1.55	0.35	--	--	--	--
08.11.14 (2100)	C/Manifold	1/4	51.73	50.45	1.30	0.42	--	--	--	--
08.11.14 (2330)	C/Manifold	1/8+1/4	53.12	52.65	1.27	0.35	--	--	--	--
09.11.14 (0600)	C/Manifold	1/8+1/4	47.83	45.16	1.55	0.56	--	--	--	--

09.11.14 (0830)	C/Manifold (1)	1/4	53.62	49.81	4.61	0.97	--	--	--	--
09.11.14 (1130)	Separator	1/4	62.89	54.01	1.75	0.60	--	--	--	--
09.11.14 (2230)	Separator	1/8	62.19	61.76	0.29	--	--	--	--	--
10.11.14 (0400)	Separator	1/8	63.12	59.88	1.14	0.41	--	--	--	--
11.11.14 (0200)	Separator	1/2	65.11	60.83	1.58	0.56	--	--	--	--
11.11.14 (1330)	Separator (2)	1/8	71.52	65.76	1.79	0.52	--	--	--	--
11.11.14 (1930)	Separator (3)	1/4	81.37	74.70	1.88	0.37	--	--	--	--
12.11.14 (0130)	Separator (4)	3/8	87.13	79.97	1.85	0.53	--	--	--	--
12.11.14 (0730)	Separator (5)	1/2	84.90	80.10	1.53	0.41	--	--	--	--

Lab Study Results of Gas Samples

Interval (m.) : 898.8

Sample No : 191/OT/2014|

C1: 79.92 %| C2: 0.3 %| C3: 0.02 %| iC4: 1.02%| nC4: 0.01 %| iC5: 0 %| nC5: 0.01 %| iC6: 0.04 %| Carbon-dioxide: 0.8 %| Nitrogen: 18.89 %| 2.02Z: 0.9984| Sp.Gr.: 0.6436| Net calorific value: 6563 Kcal/m3| Gross calorific value: 7287 Kcal/m3.

Sample No. : 646/OT/2014|

C1: 86.81 %| C2: 0.35 %| C3: 0.18 %| iC4: 0.09 %| nC4: 0.16%| iC5: 0.12 %| nC5: 0.15 %| C6+: 3.17 %| Carbon-dioxide: 0.25 %| Nitrogen: 8.72 %| Sp.Gr.: 0.6829| Net calorific value: 8550.15 Kcal/m3.

4.1.5 Geology and Reservoir Description of GKS092NAA-1

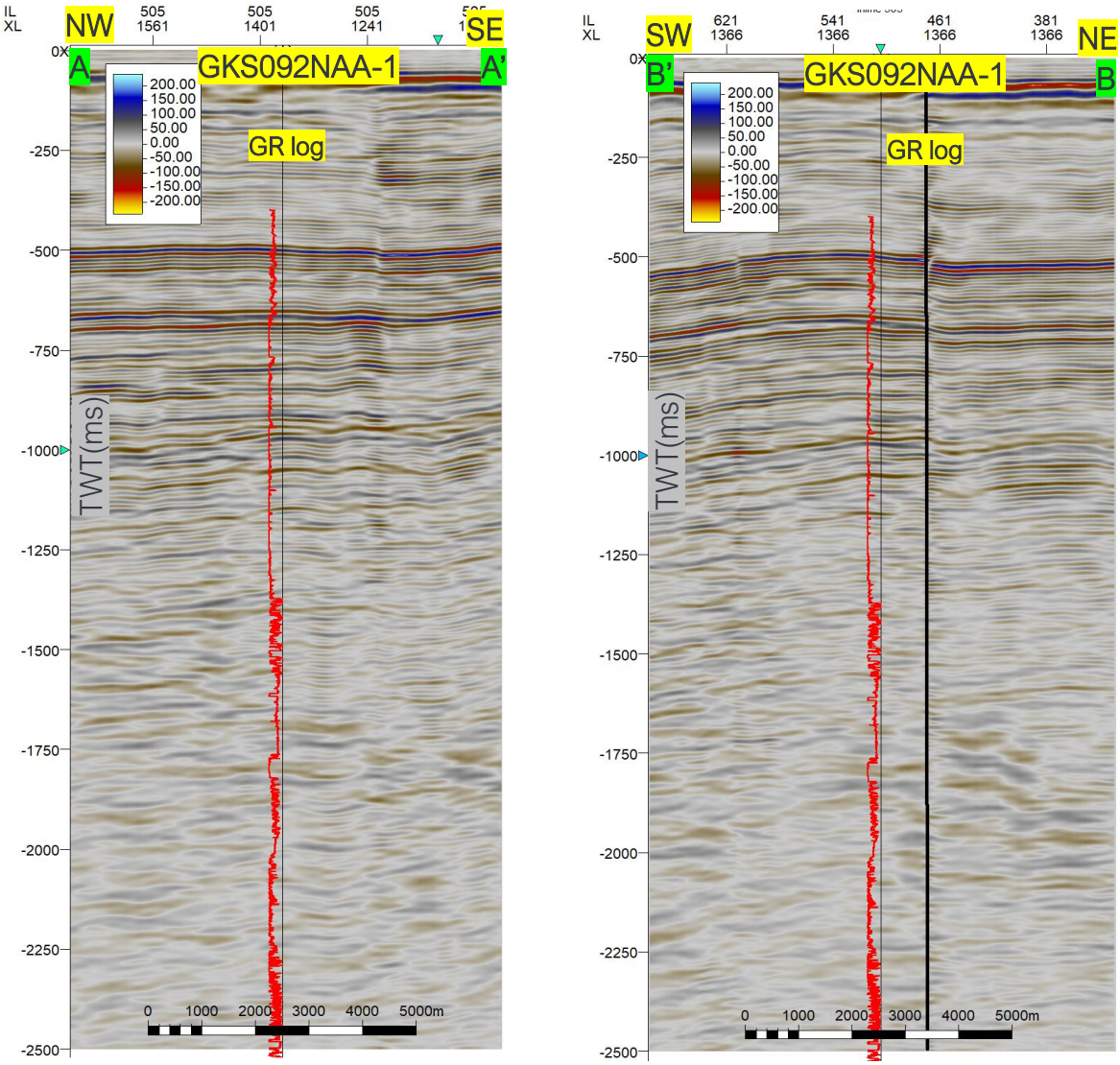
The geology of the area has been comprehensively reviewed using correlations, sections and maps. The well correlation, seismic sections, top structure, and net sand/pay maps have been used to illustrate the magnitude and distribution of key reservoir properties in and around the discovered gas pools (accumulations). The local tectonic setting and geological section of the area, wherever available, are also given. These maps/sections are sequentially shown reservoir unit-wise through figures, appropriately titled and illustrated in the following section.

4.1.5.1 Geological correlations, Sections and Maps (GKS092NAA-1):

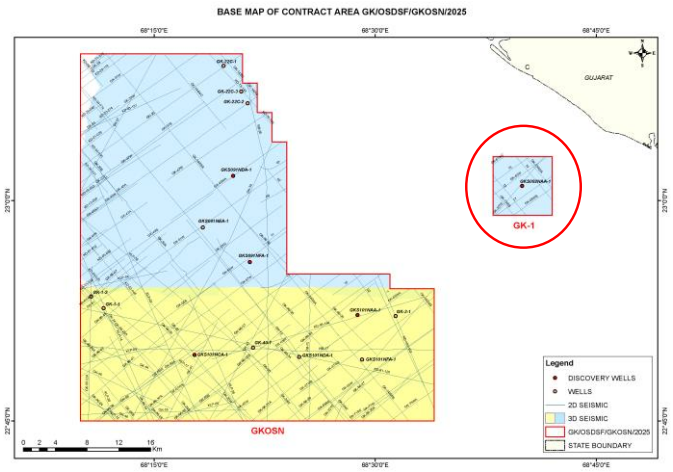
GK-1 Polygon has only one well GKS092NAA-1, which produced gas from Jakhau Formation. The identified prospect is a trap door closure bounded in the east and south by reactivated reverse faults. At Early Miocene, the amplitude of the prospect is 80ms which increases to 220ms at Jurassic (Figure 4-6). Both the bounding faults are deep-seated and significant faults which are mapped at all levels on both Mesozoic and Tertiary sections. Structural closure is well seen in 3D volume.

This structural closure is a result of transgressive forces imparted during Early Eocene and beyond which inverted both Tertiary & Mesozoic sections along the NW-SE trending reverse faults (Figure 4-7 and Figure 4-8). Gas pay of around 2 m has been encountered in the well in Early Miocene which during testing produced Gas @ 1,15, 168 m3/day through 32/64” Choke.

Figure 4-6: Seismic cross-sections passing through well GKS092NAA-1



Vertical exaggeration: 7.5x
Seismic volume: 00003.GK-OSN-2009_1_2_FINAL_PSTM_STACK_



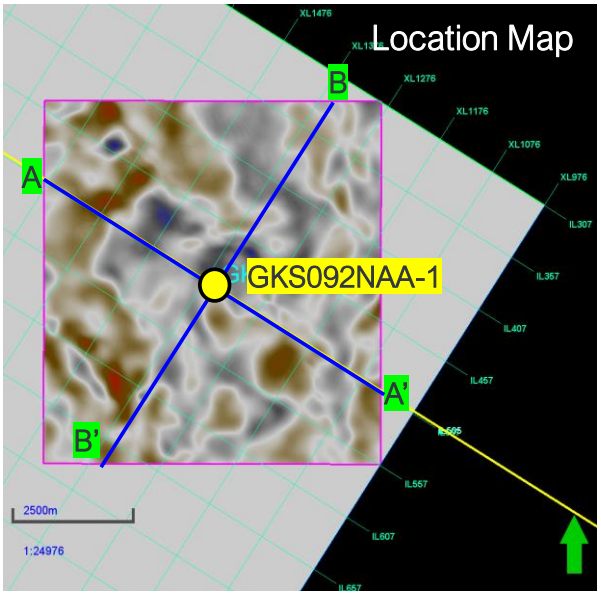


Figure 4-7: Time structure map of Early Eocene

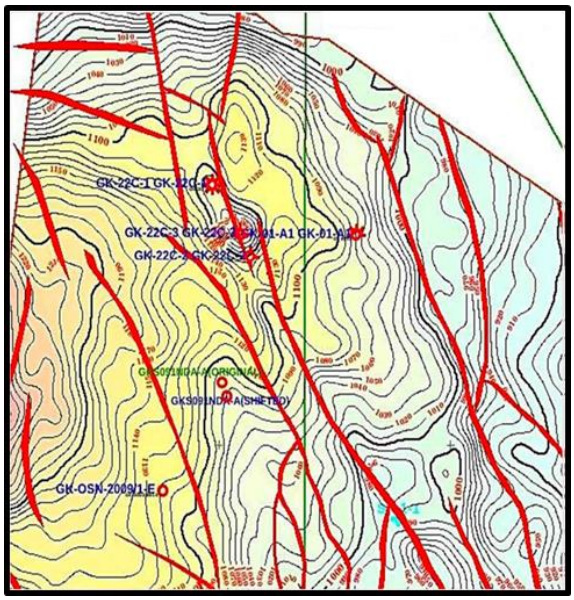
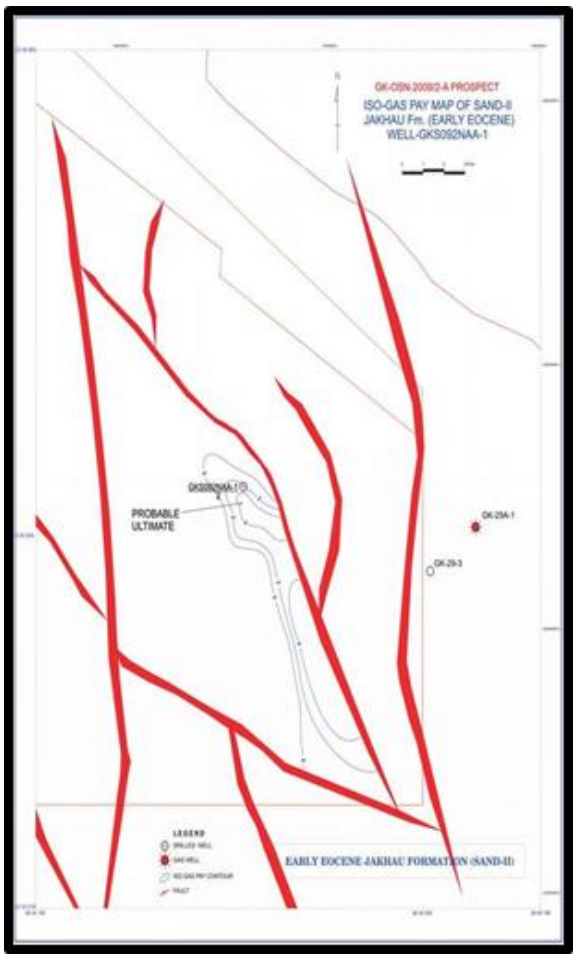


Figure 4-8: Net sand/pay map Early Eocene



4.1.6 Reservoir parameters and hydrocarbon estimates (GKS092NAA-1)

The estimates of hydrocarbon in-place have been worked out under various field assumptions. All inputs, working and results, as available and sourced are presented in the following section.

Reservoir	: Eocene (Jakhau) (898-900m)
Block	: GKS092NAA-1
Area	: 0.634 sq.km
Thickness	: 2 m
Porosity	: 0.29
Hydrocarbon saturation	: 0.6
Formation volume factor	: 0.013

The field, GKS092NAA-1 has In-place gas of **0.017 MMTOE**.

Erstwhile Operator-reported estimates on record:

The GKS092NAA-1 has a reported gas estimate of **0.021 MMTOE**.

All these hydrocarbon estimates are subject to future assessments based on Operator's own technical insights and additional information/data, which may warrant possible revision of the currently reported estimates.

4.1.7 Production facility for Oil & Gas Evacuation

Production facilities for Oil & Gas Evacuation are summarized in Table 4-11.

Table 4-11: GKS092NAA-1 Production facility for Oil & Gas Evacuation

Sl No	Discovery Name	Basin	Water Depth (mtr)	Oil/Gas	Initial Testing details Gas Rate	Pay sand	Depth of discovered reservoir (TVDSS)	Near-by surface Facility with distance
1	GK-1 (GKS092NAA-1)	Kutch Shallow Offshore	3.5	Gas	Qg=115168 m3/d through ½" choke		898-902 mtr	Upcoming SunPetro Dwarka Onshore Terminal (GK-28) : 120 KM.Cairn Suvali Plant: 489 KM
2	GKOSN-2009/1-D (GKS091NDA-1)	Kutch Shallow Offshore	18	Gas	1,80,000 m3/d	Jakhau (Jakhau & Early Eocene)	1450m	No Facility exists in the region. Planned for evacuation to Dwarka
3	GKS091NFA-1 (GKS091NFA-1)	Kutch Shallow Offshore	19	Gas	2,36,524 m3/d	Weathered Dolerite (Naliya & Mid Cretaceous)	3770m	No Facility exists in the region (Planned for evacuation to Dwarka)
4	GK-OSN-2010-1-A(GKS101NAA-1)	Kutch Shallow Offshore	16	Gas	45,873 m3/d through 1/2" choke, FTHP 250psi	Jakhau (Jakhau & Early Eocene)	1260m	No Facility exists in the region (Planned for evacuation to Dwarka)
5	GK-OSN-2010-1-C (GKS101NCA-1)	Kutch Shallow Offshore	32	Gas	1,63,000 m3/d	Chhasra FM (Chhasra & Mid Miocene)	880m	No Facility exists in the region (Planned for evacuation to Dwarka)
6	GSOSN-2004/1-A (GSS041NAA-1)	Kutch Shallow Offshore	99	Gas	35,597 m3/d (3/8")	Jhuran & Late Jurassic	4370m	Dwarka-115 KM
7	GSS041NAA-B (GSS041NAA-2)	Kutch Shallow Offshore	92	Gas	1,56,563 m3/d	Bhuj & Early Cretaceous	4370m	Dwarka-115 KM

4.1.8 Status of Additional wells in the Contract Area/Polygon

There is one discovery well in the polygon (GKS092NAA-1) and no other well in this polygon.

4.1.9 Main reports available for well GKS092NAA-1

- WCR/FER
- Interpretation Report for GK-OSJ-1, April 2003
- Geochemical Characterization of Formation Fluid in CC-1 of well GKS092NAA-1
- Characteristics of Gas from well GKS092NAA-1
- Discovery Report, Format-A, GKS092NAA-1
- Reservoir Study Report of Well GKS092NAA-1
- FMI Report (3700-4268m) of well GKS092NAA-1

GK/OSDSF/GKOSN/2025 GKS091NDA-1 FIELD

4.2 DESCRIPTION OF KUTCH OFFSHORE GKS091NDA-1 (GK-OSN-2009/1)

The Well GKS091NDA-1 was proposed on a prospect, a fault closure plunging to NNW, with a planned target depth of 4030m. This well was part of the NELP block GK-OSN-2009/1 in Kutch - Saurashtra basin. The objective of drilling the location was to explore the Hydrocarbon potential of Early Cretaceous, Paleocene, Eocene and Miocene Sequences. The Well GKS091NDA-1 was spudded on 22.05.2014 & drilling was terminated at 3452m within dolerite sill in view of down-hole complications.

The well is located south of Well GK-22C-1, which flowed gas @ 2,80,000 m3/day from Early Cretaceous Bhuj Sandstone. Other nearby hydrocarbon producing wells are in GK-28 & 42 area which are located Southeast of this block and have gas discoveries from Tertiary Formations (Middle Miocene, Early Eocene and Paleocene) & well GK-28-2 flowed Oil from sandstones of Cretaceous age. The cluster GK-28 & 42 have been awarded under DSF-III and is currently under development. There are two gas discoveries (GKS101NAA-1 & GKS101NCA-1) in the earlier NELP Block GKS-OSN-2010/1 south of this discovery which are part of this GKSN Polygon.

4.2.1 Drilling and Well completion

In the polygon GKOSN, there are four discoveries GKS091NDA-1, GKS091NFA-1, GKS101NAA-1 & GKS101NCA-1 and there are 10 additional wells drilled in this polygon of the contract area. Key information of the well GKS091NDA-1 has been collated and presented hereunder. This includes the Well Construction Diagram (Figure 4-9) and the Litho-column Information (Figure 4-10).

Figure 4-9: Well construction Diagram of Well GKS091NDA-1

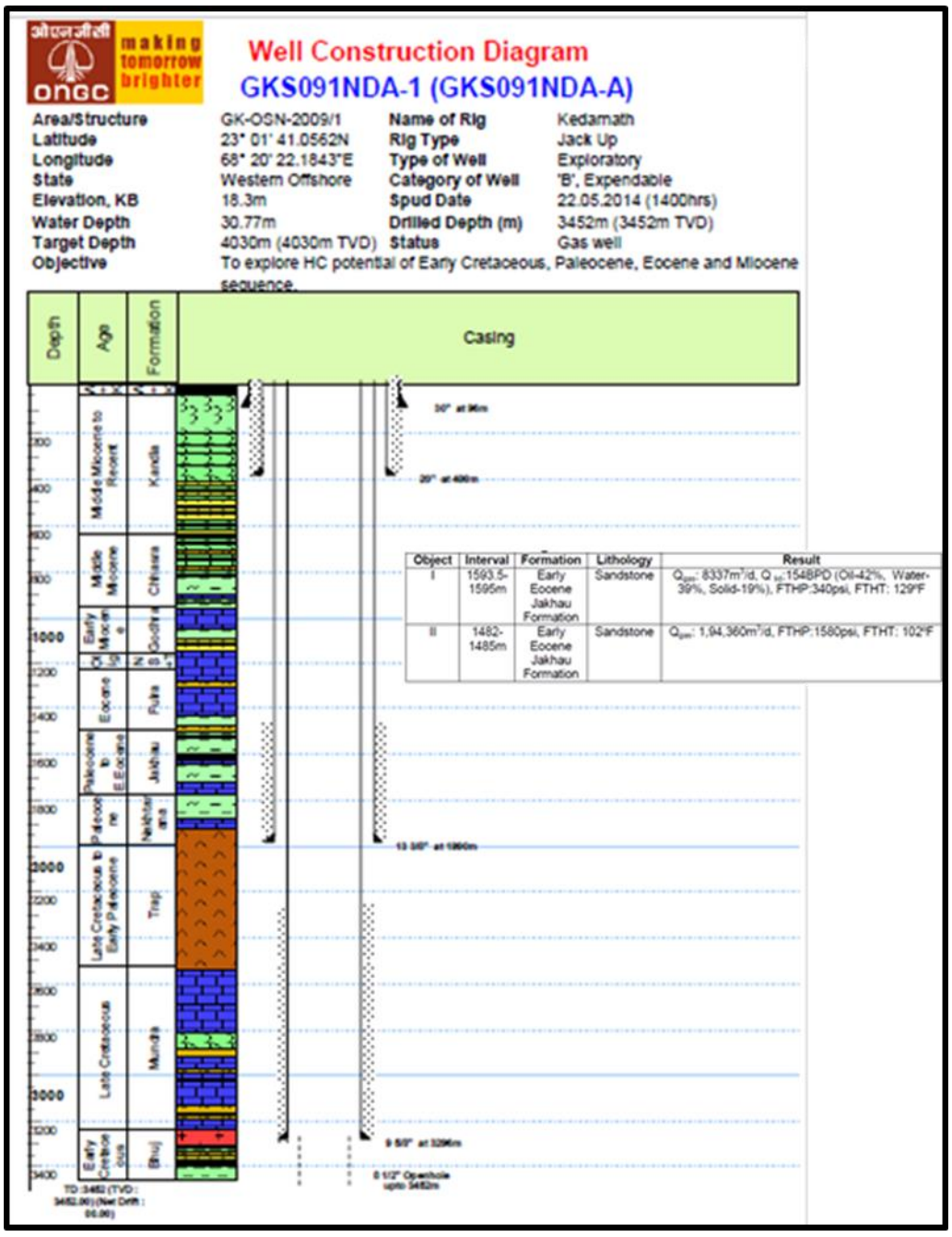
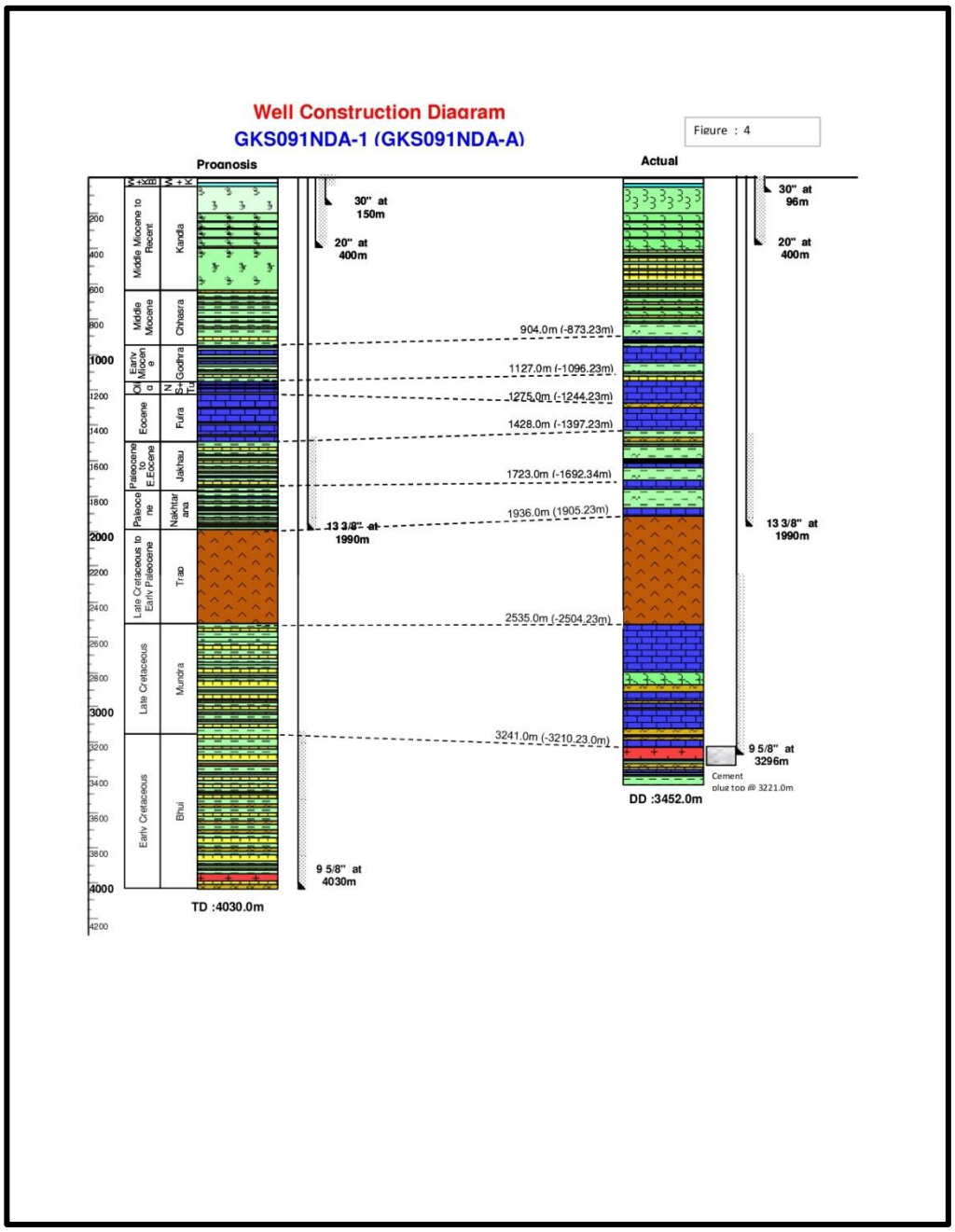


Figure 4-10: Lithology Diagram of Well GKS091NDA-1



4.2.2 Well Logging and Formation Evaluation

The well logs of all discovery wells along with some key wells in the contract area have been reviewed. The logs recorded in various open-hole sections along with cased-hole logs and information of conventional and other wireline formation test data are presented in this docket.

The availability of key input reports like Well Completion Reports (WCR) and Formation Evaluation Report (FER) have been checked and information given. Reservoir parameters of interesting zones and results of the tested zone(s) have been included in this report. Log motifs of tested/ interesting zone of key wells are also appended (Figure 4-11 and Figure 4-12).

A) Well completion and log evaluation reports availability (GKS091NDA-1)

WCR/ FER availability	Spud date	KB	Drilled depth/ Water Depth
Only WCR available	22.05.2014	18.3 m	3452m/ 30.77m

B) Well logs acquired (GKS091NDA-1)

Sl. No	HOLE/ CSG SIZE (")	Date	INTERVAL (m)	LOGS	REMARKS
1	12.25" pilot hole in 17.5" section	17.06.14	1980-399	SS-PPC-GR	BHT:200°F
2		17.06.14-18.06.14	1985.0-399.4	ECS-GR	BHT:210°F
3		18.06.14	1986.0-399.4	PEX-AIT-HNGS	BHT:200°F
4		18.06.14-19.06.14	1878.0-991	MSCT-GR	Total attempted:30, Recovered: 12, Accepted: 5.
5		20.06.14	1984.9-185.5	VSP-GR	-
6		21.06.14-22.06.14	1839.0-436.0	MDT-GR	Total pretests: 30, Good: 10, Tight:14, lost seal: 6, 2 samples at 1482.5m & 1594.8m. Samples:2
7		23.06.14-24.06.14	1839.0-436	MDT-GR	Total pretests: 31, Good:3, Tight:23, lost seal:5, Sample at 1627.0m
8		24.06.14	1839.0-574	CST-GR	Attempted: 25, Recovered: 24, Accepted:19,
9	12.25	29.09.14	3296-1990.5	PEX-AIT-HNGS	BHT:251.2°F
10	12.25	29.09.14	3296-1990.5	SS-PPC-GR	BHT:260.4°F

11	8.5	05.11.14	3285.2-1788	VSP	BHT: 260°F
12	9 5/8	08.11.14	1700-1400	CBL-VDL-CCL-GR	
13	9 5/8	14.11.14	1625-1400	USIT-CBL-VDL-CCL-GR	

C| Well log evaluation and initial test results (GKS091NDA-1):

Interval (mMDRT/mTVDSS)	Formation (Zone, if specified)	Net(m)	Phi	Sg
1482-1485m (Obj-II)	Jakhau	2.14	27	43%

Figure 4-11: Well Log Motif of well GKS091NDA-1, Object-I

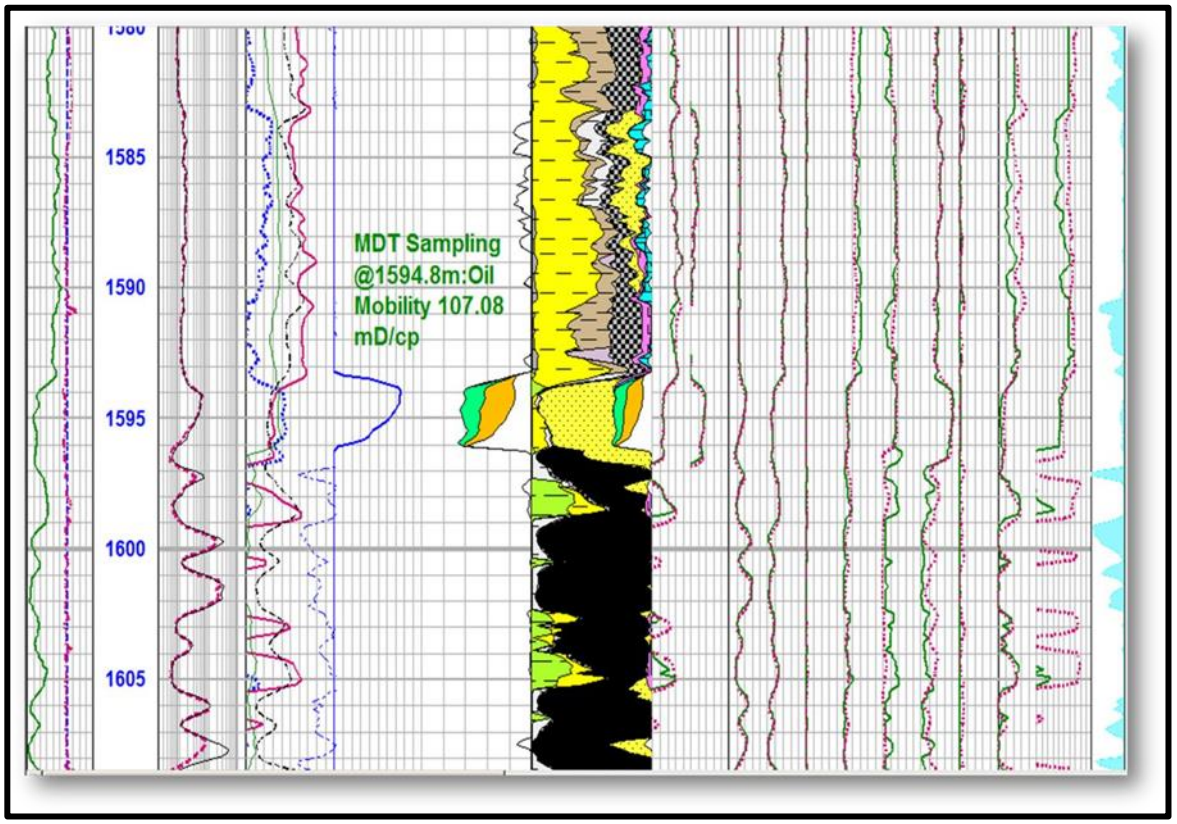
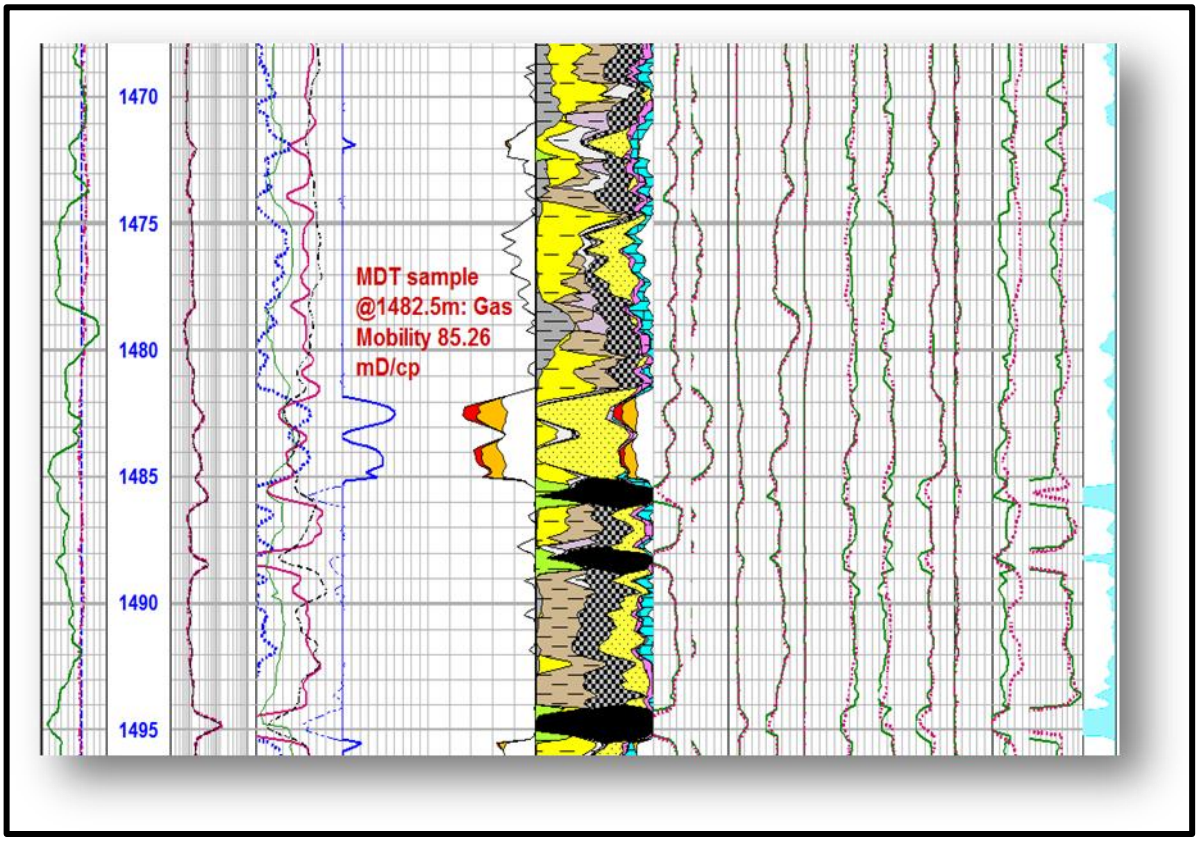


Figure 4-12: Well Log Motif of Well GKS091NDA-1, Object-II



4.2.3 Well testing and workover history

Two objects were tested in this well. Object-I tested in intervals 1593.5-1595m & flowed little gas with BSW of around 58%. Object-II was tested in the interval 1482-1485m - in Jakhau Sandstone flowed gas @194360 m3/day through ½" choke at FTHP 1580 psi. Detailed testing results are presented in Table 4-12.

Table 4-12: GKS091NDA-1 well testing results for Jakhau Object-I and Object-II

Formation	Object	Interval (m)	Bean (1/64")	FTHP (psi)	Qgas (m3/day)	FTHT (oF)	Remarks
	I	1593.5-1595m	32	340	8337	129	BSW-58% (Water-39%, Solid-19%)
Jakhau	II	1482-1485m	16	1840	51209	75	K - 90.1 mD, Skin-0.72, P* - 2150.8 psi, AOFP-1.028 X 10^6 m3/day. C1-91.8%, C2-0.93%, N2-5.66%
			24	1740	127526	75	
			32	1580	194360	102	

4.2.4 Reservoir engineering studies and analysis

Key reservoir engineering datasets, wherever available have been collated and presented under various data genres. In a comprehensive data presentation, the results are included from well tests, formation dynamics tests, reservoir pressure build-up study and PVT data/ results.

4.2.4.1 Formation dynamics tests (GKS091NDA-1)

MDT Pressure Data

MDT tests were carried out in 12 ¼" pilot hole in 17.5" section which included total pretests: 60, Good: 13, Tight: 37, Lost seal: 11

MDT samples were recorded in 12 ¼" as presented in **Table** 4-13.

Table 4-13: GKS091NDA-1 – MDT sampling and tests in 12 ¼"

S. No.	Capacity / Recovery (lit)	Sample Depth (m)	Fm pr (psi)	MWE (ppg)	Down hole temp (DegF)	Mob (mD/ Cp)	Mud pressure		Formation/ Lithology	Remarks
							Before	After		
1	0.42	1482.5	2164.4	8.55	168.8	85.26	2659.1	2652.0	Jakhau/ Sandstone	Gas (drained at surface): TG: 54%, C1:41.46%, C2= 4.165 %, C3= 1.611%
2	10/9.5	1594.8	2321.5	8.53	184.9	107.1	2850.6	2853.1		Oil (drained at surface): Brownish black in colour , API: 24.04^{0}.Gas (drained at surface): TG: 68%, C1:57.1029%, C2= 4.5601%, C3= 0.8523
3	10/9.25	1627	2381.5	8.58	196.2	7.16	2907.5	2906.7	Jakhau / Limestone	Water with SOBM (Drained at surface): Salinity:40,000 ppm as NaCl , PH=7 , Mud salinity during drilling: 43,000 ppm as NaCl Gas (Drained at surface): TG: 71%, C1: 64.05%, C2= 1.24%, C3= 1.27%

4.2.4.2 Pressure Build up Study Results

Object-I 1595.0m-1593.5m

Object-I was tested with DST-TCP and results are presented in Table 4-14 and Table 4-15.

Table 4-14: GKS091NDA-1 – DST-TCP test results Object-I

Choke Size(")	Liquid (BPD)	Gas (m3/day)	FTHP (PSI)	FTHT (ºF)	Oil API	Remarks (Flow content etc.)
½	141	8220	340	129	-	Oil flowed with mud. Hence flowrate is given as Q liquid. Oil-22%, Water-44% & Sediments-35%

Table 4-15: GKS091NDA-1 – DST-TCP Object-I composition

Choke Size	TG (%)	C1 (%)	C2 (%)	C3 (%)	IC4 (%)	NC4 (%)	IC5 (%)	NC5 (%)
1/2	88.29	64.43098	4.50017	3.4607	1.08064	0.96632	0.790	0.7908
1/2	84.81	36.62005	1.89274	0.66648	0.48366	0.48966	0.790	0.7900

Object-I was re-tested with DST and results are presented in Table 4-16 and Table 4-17.

Table 4-16: GKS091NDA-1 – DST re-test results Object-I

Choke Size (")	Liquid (BPD)	Gas (m3/day)	FTHP (PSI)	FTHT (ºF)	Oil API	Remarks (Flow content etc.)
½	154	8337	340	106	-	Oil flowed with mud. Hence flow rate is given as Q liquid.

Table 4-17: GKS091NDA-1 – DST re-test Object-I composition

Date	Choke Size	TG (%)	C1 (%)	C2 (%)	C3 (%)	IC4 (%)	NC4 (%)	IC5 (%)	NC5 (%)
04.12.2014	1/2	80.45	62.84	4.5007	1.156	1.080	0.487	0.310	0.283

The maximum pressure and temperature recorded during DST was 2209.158 Psia and 193.68 Deg F respectively (refer to Figure 4-13, Figure 4-14 and Figure 4-15). Due to large variation in the BS&W content during testing and also large variation in bubble point pressure parameters, analysis of DST to derive the reservoir parameters was not carried out.

Figure 4-13: GKS091NDA-1 Pressure Build-up Plot (Obj-I, DST-1)

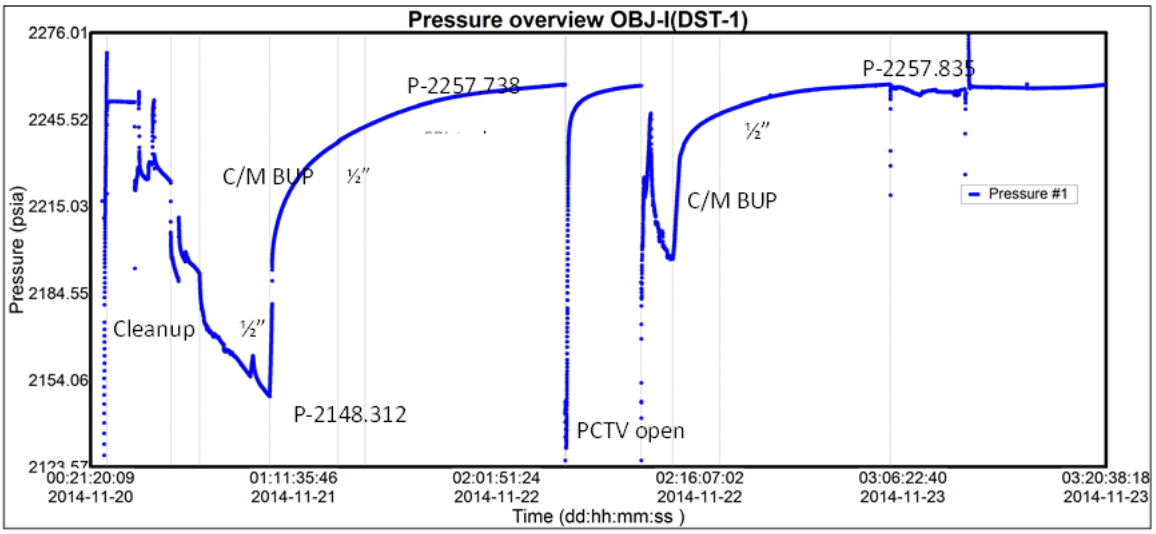


Figure 4-14: GKS091NDA-1 Pressure Build-up Plot (Obj-I, DST-2)

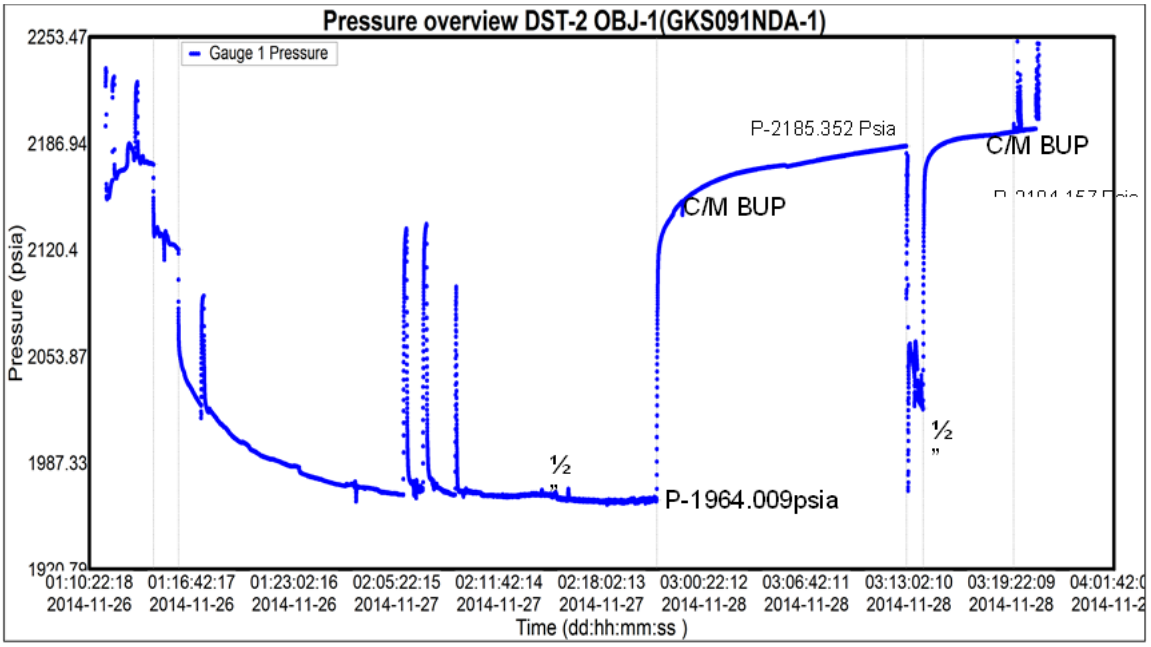
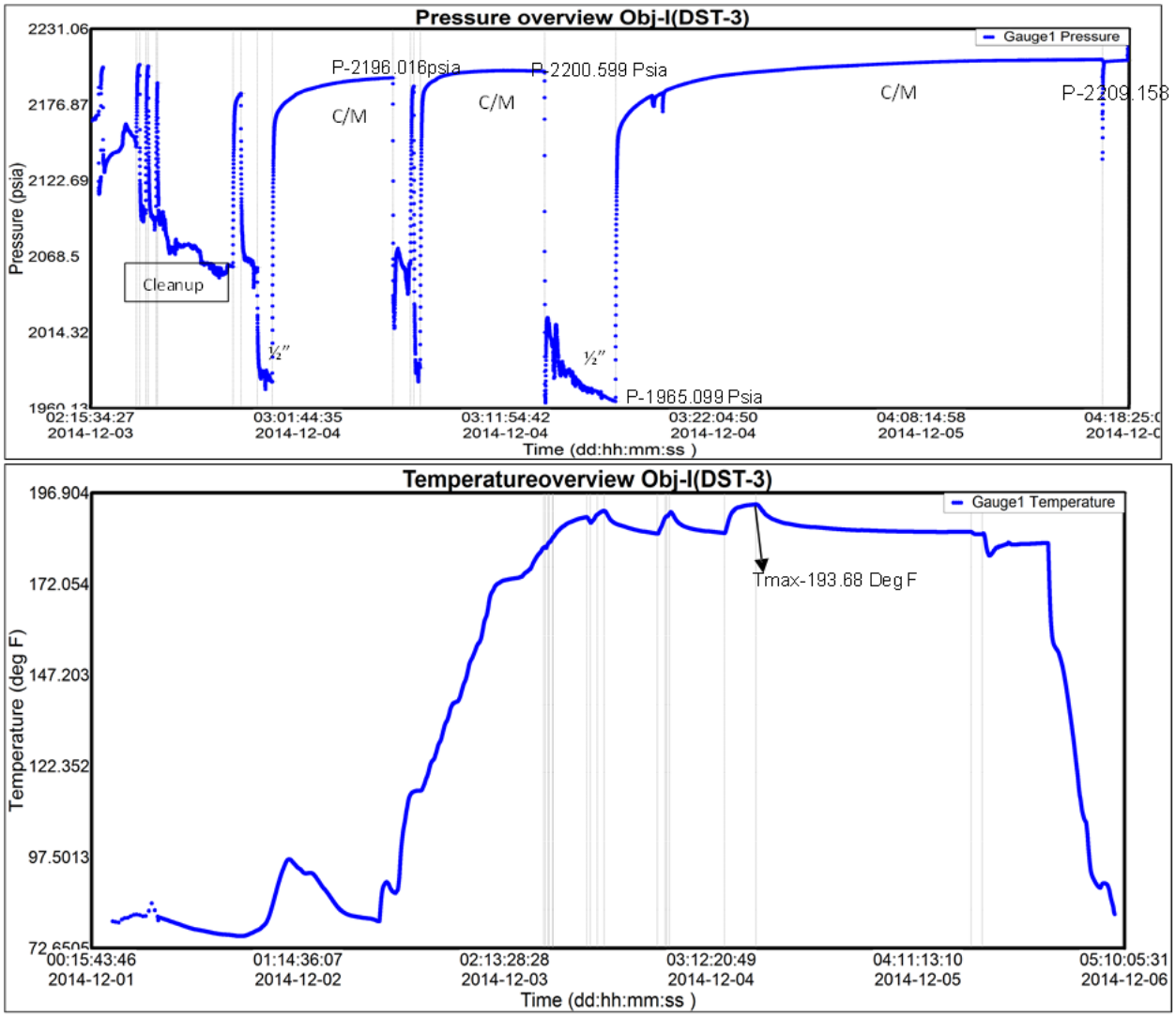


Figure 4-15: GKS091NDA-1 Pressure Build-up & Temperature Plots (Obj-I, DST-3)



Object-II (1482-1485m), Jakhau

Object-II was tested with wireline perforation and results are presented in Table 4-18, Table 4-19, Figure 4-16 and Figure 4-17.

Table 4-18: GKS091NDA-1 – Wireline test results Object-II

Choke Size	Oil (BPD)	Gas (m^3/day)	FTHP (PSI)	FTHT (ºF)	STHP	Oil API	Remarks (Flow content etc.)
½	-	180,025	1580	100	-	-	-
¼	-	51209	1840	75	-	-	-
3/8	Not measurable	127526	1740	75	-	28.38	Well flowing gas with traces of oil.
½	Not measurable	194360	1580	102	-		

Table 4-19: GKS091NDA-1 – Well composition Object-II

Choke Size	TG (%)	C1 (%)	C2 (%)	C3 (%)	IC4 (%)	nC4 (%)	IC5 (%)	nC5 (%)
½	92.68	91.54						
¼	87.65	84.57	1.08	-	-	-	-	-
3/8	88.57	86.98	-	-	-	-	-	-

Figure 4-16: GKS091NDA-1 Pressure Build-up Plot (Obj-II, DST-1)

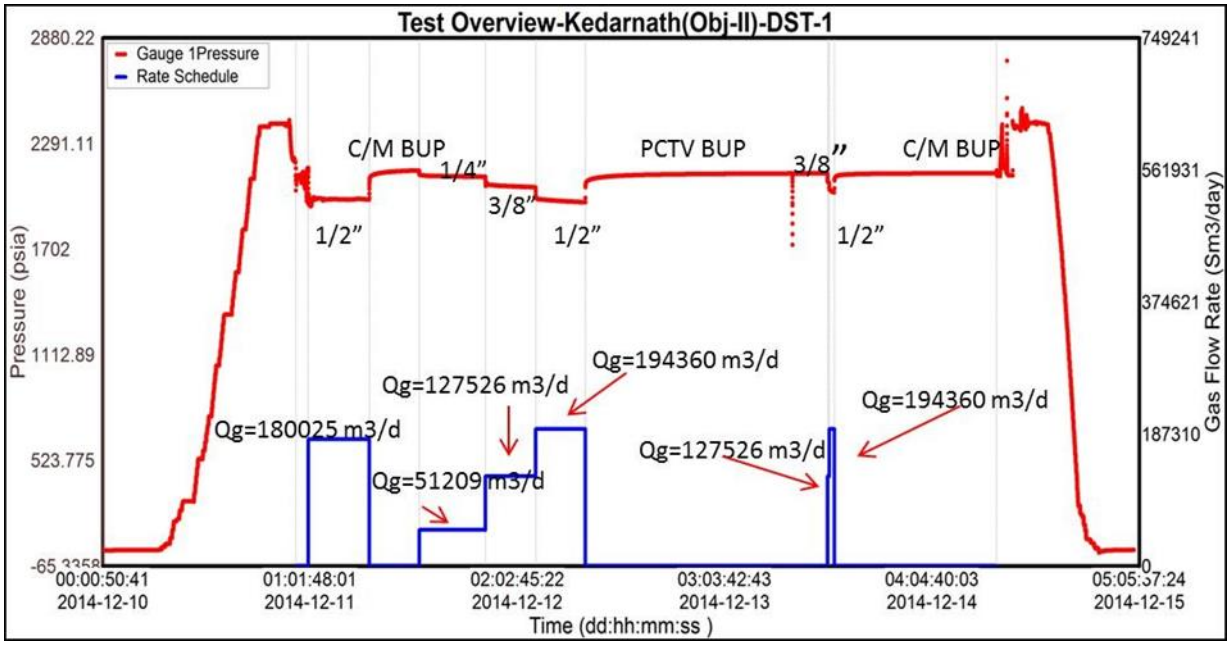
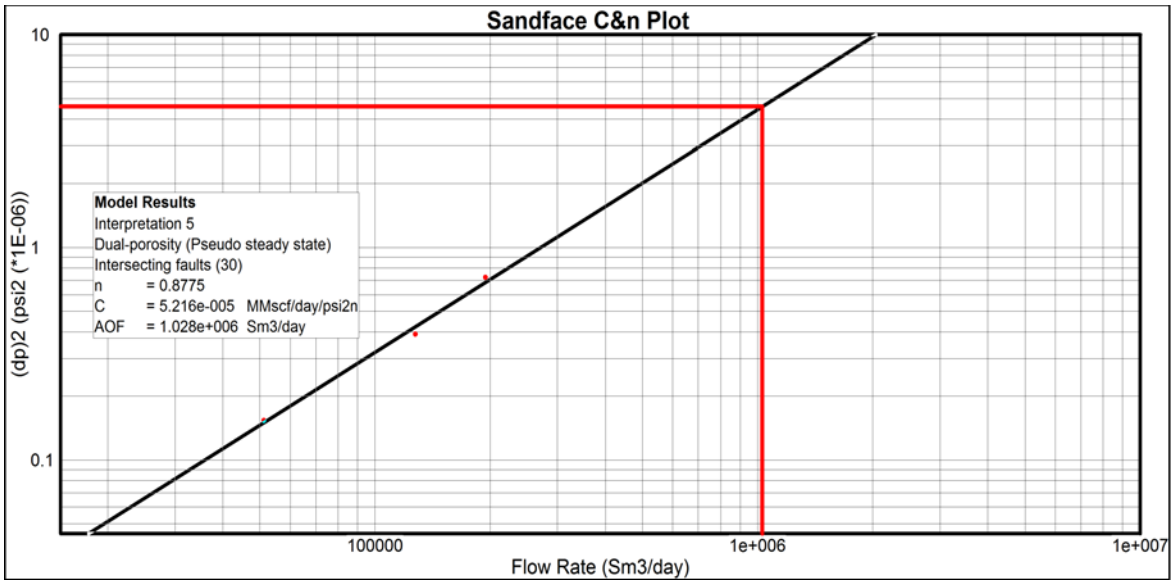


Figure 4-17: GKS091NDA-1 Sandface C&Nn Plot (Obj-I, DST-1)



Object-II was re-tested with wireline perforation and results are presented in Table 4-20 and Table 4-21.

Table 4-20: GKS091NDA-1 – DST re-test results Object-II

Choke Size	Oil (BPD)	Gas (m^3/day)	FTHP (PSI)	FTHT (ºF)	STHP	Oil API	Remarks (Flow content etc.)
½	Not measurable	179,347	1480	104	-	29	Well flowing gas with traces of oil.

Table 4-21: GKS091NDA-1 – Results of Pressure Transient studies of Object-II

Parameters	Results
Wellbore storage coefficient(bbl/psi)	0.0084
Permeability (md)	90
Skin factor	-1.6
Simulated reservoir pressure(Psia)	2137.708
AOFP, m3/day	1.028 X 10^6

The major results of two objects tested in the well GKS091NDA-1 are given below

OBJECT-I

a) No reservoir parameters were derived in view of high BS&W values
b) The maximum recorded reservoir pressure is 2194.157 Psia

OBJECT-II

a) The estimated value of permeability is 90.175md.
b) The estimated value of skin is (-ve)0.728
c) The extrapolated reservoir pressure (P*) is 2150.837 Psia.
d) The estimated AOFP is **1.028 x 10^6 Sm^3/Day**.

Detailed Reservoir Study report is available for Object-I & II.

4.2.4.3 PVT Analysis of Reservoir Fluid

a) The reservoir fluid from well GKSO91NDA-1, collected at depth of 1594.81 m MD (Object-I) , is under-saturated at reservoir conditions as its initial bottom hole pressure 2322 psia is greater than the bubble point pressure of 1954.1 psig.
b) Gas samples of Object-I indicate C1 in the range of 81.68 to 83.4 % and C2+ varies between 9.01 to 12.97%. Gas is thermogenic in nature. H2S vary between 200-1100 ppm
c) Gas samples of Object-II indicate C1 in the range of 85.72 to 89.91 % and C2+ varies between 1.55 to 1.86 %. Gas is thermogenic in nature. H2S vary between 200-900 ppm

Gas sample analysis of MDT sample is presented in Table 4-22.

Table 4-22: GKS091NDA-1 – MDT Gas sample composition

Sl.No	Components	Vol %
1	**Methane**	**91.80**
2	Ethane	0.93
3	Propane	0.39
4	i-Butane	0.09
5	n-Butane	0.11
6	i-Pentane	0.04
7	n-Pentane	0.04
8	Hexane	0.30
9	Carbon Dioxide	0.64
10	Nitrogen	5.66
	Gas Sp. Gravity	0.6045

Detailed PVT report and Gas analysis report are available.

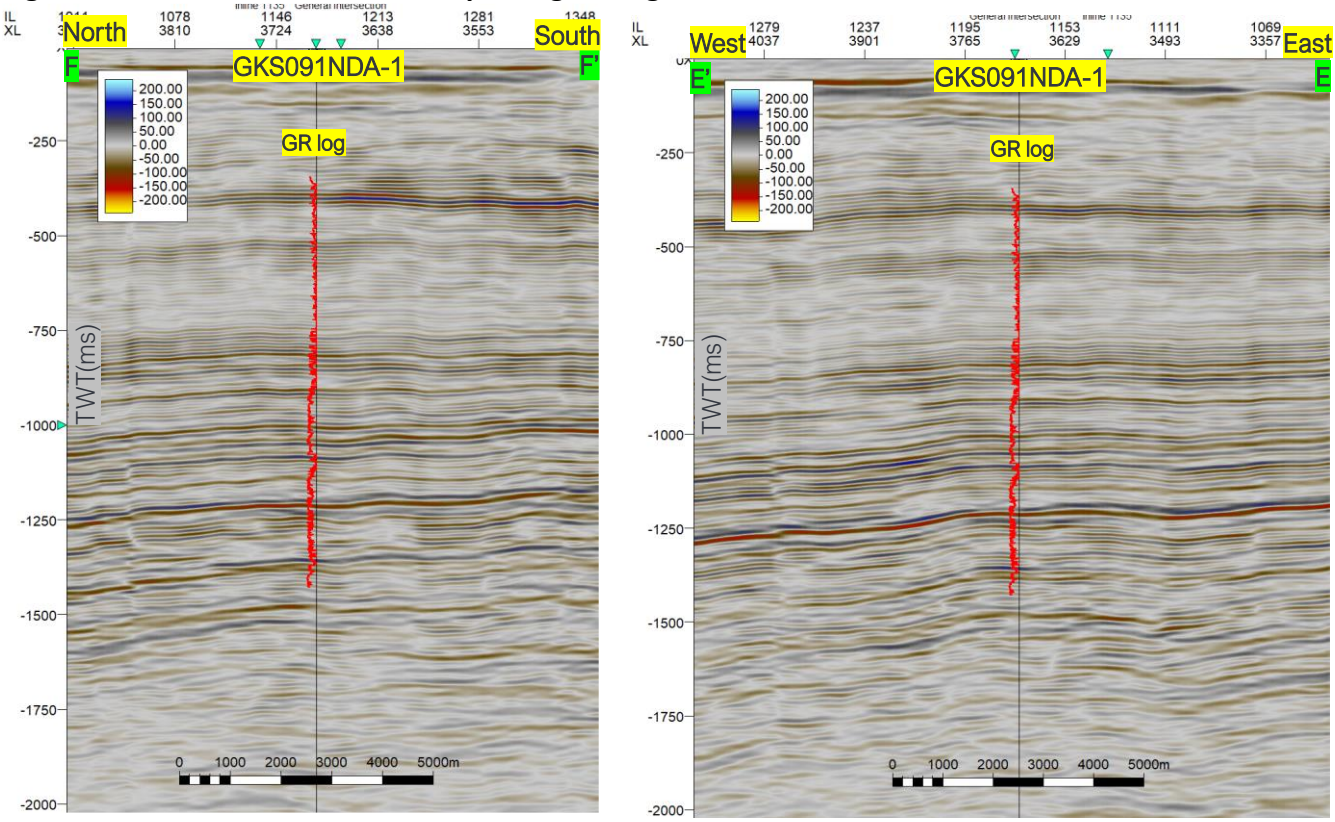
4.2.5 Geology and Reservoir Description of GKS091NDA-1

The geology of the area has been comprehensively reviewed using correlations, sections and maps. The well correlation (example, Figure 4-19), seismic sections (example, Figure 4-18), top structure (example, Figure 4-20 and Figure 4-21), seismic attribute/amplitude and net sand/pay maps have been used to illustrate the magnitude and distribution of key reservoir properties in and around the discovered oil/gas pools (accumulations). The local tectonic setting and geological section of the area, wherever available are also given. These maps/sections are sequentially shown field-wise and reservoir unit-wise through figures, appropriately titled and illustrated in the following section.

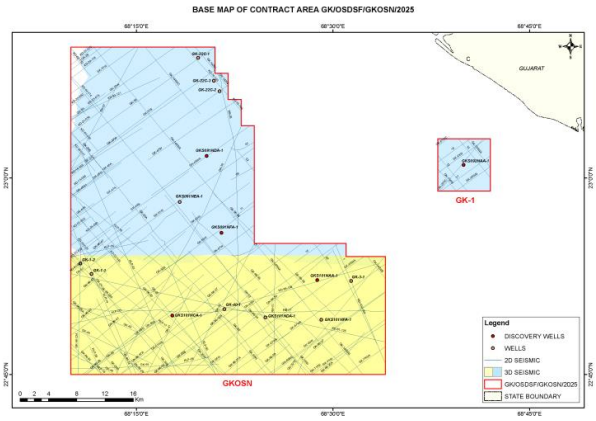
A). Geological correlations, sections and maps GKS091NDA-1

GKS091NDA-1 is on a fault closure plunging to NNW, with a target depth of 4030m with the objective to explore the HC potential of Early Cretaceous, Paleocene, Eocene and Miocene Sequences. Well GKS091NDA-1 was drilled upto 3452m within dolerite sill in view of down-hole complications, very poor drillability. It has penetrated the normal sequences of Kandla. Chhasra, Godhra, Narayan Sarovar, Tuna, Fulra, Jakhau, Nakhtarana, Trap, Mundra and Bhuj Formations. Two objects were tested in Jakhau Formation. Object – 1 (1595 - 1593.5m) on testing through ½" choke produced gas @ 8337m3/day and liquid (oil and water) @ 154bbls/day at FTHP 340psi. Object-II (1485-1482m) produced gas @ 1, 94,360 m3/day through ½" choke at FTHP 1580psi.

Figure 4-18: Seismic cross-sections passing through well GKS091NDA-1



Vertical exaggeration: 7.5x
Seismic volume: 00003.GK-OSN-2009_1_2_FINAL_PSTM_STACK_



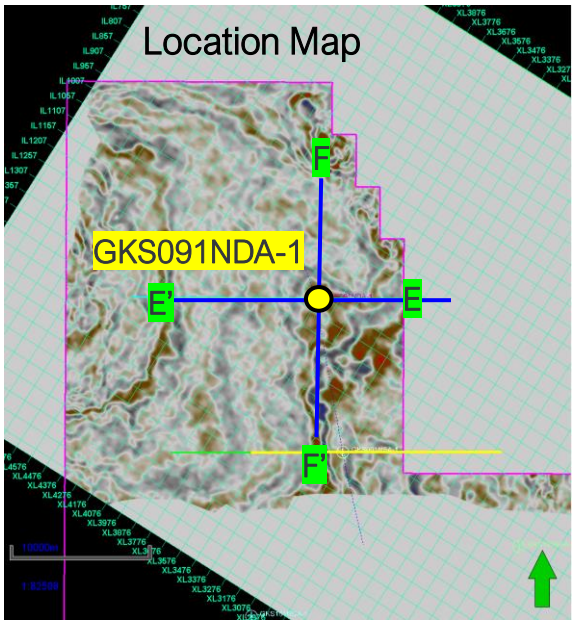


Figure 4-19: Electrolog correlation along wells GKS091NDA-1, GKS091NEA-1 and GKS091NFA-1 for Early Eocene, Sand II and Sand I Tops

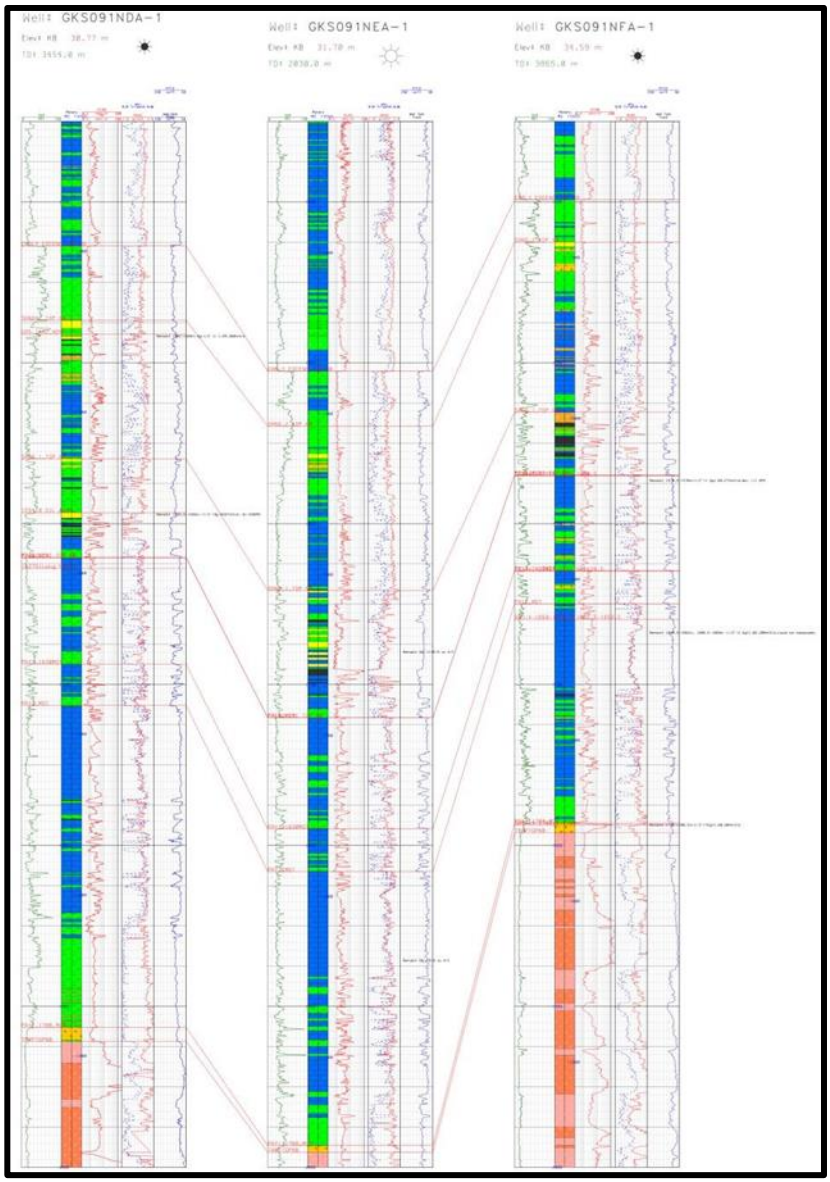


Figure 4-20: Structure map on top of Sand II (Early Eocene) Pay of well GKS091NDA-1

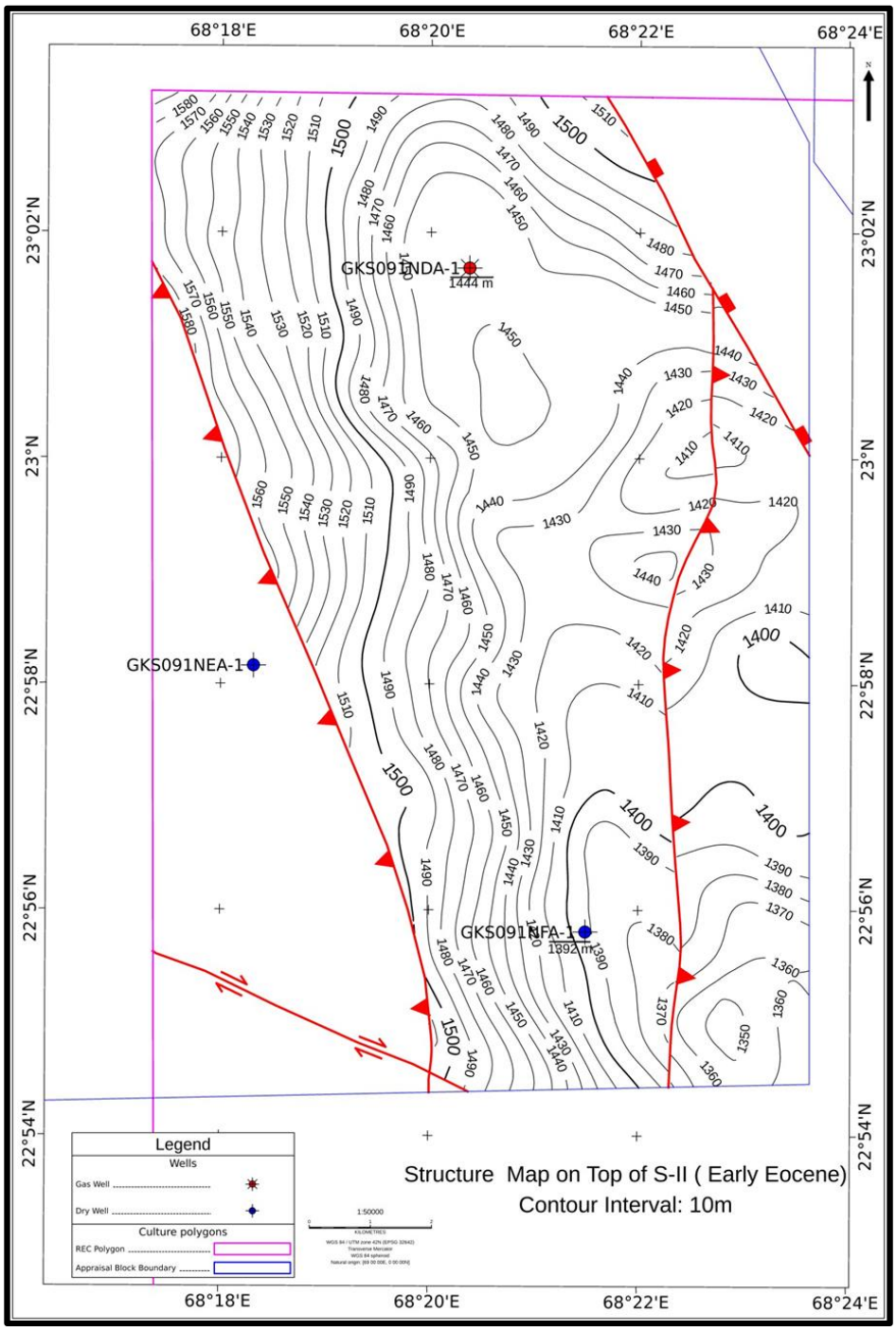
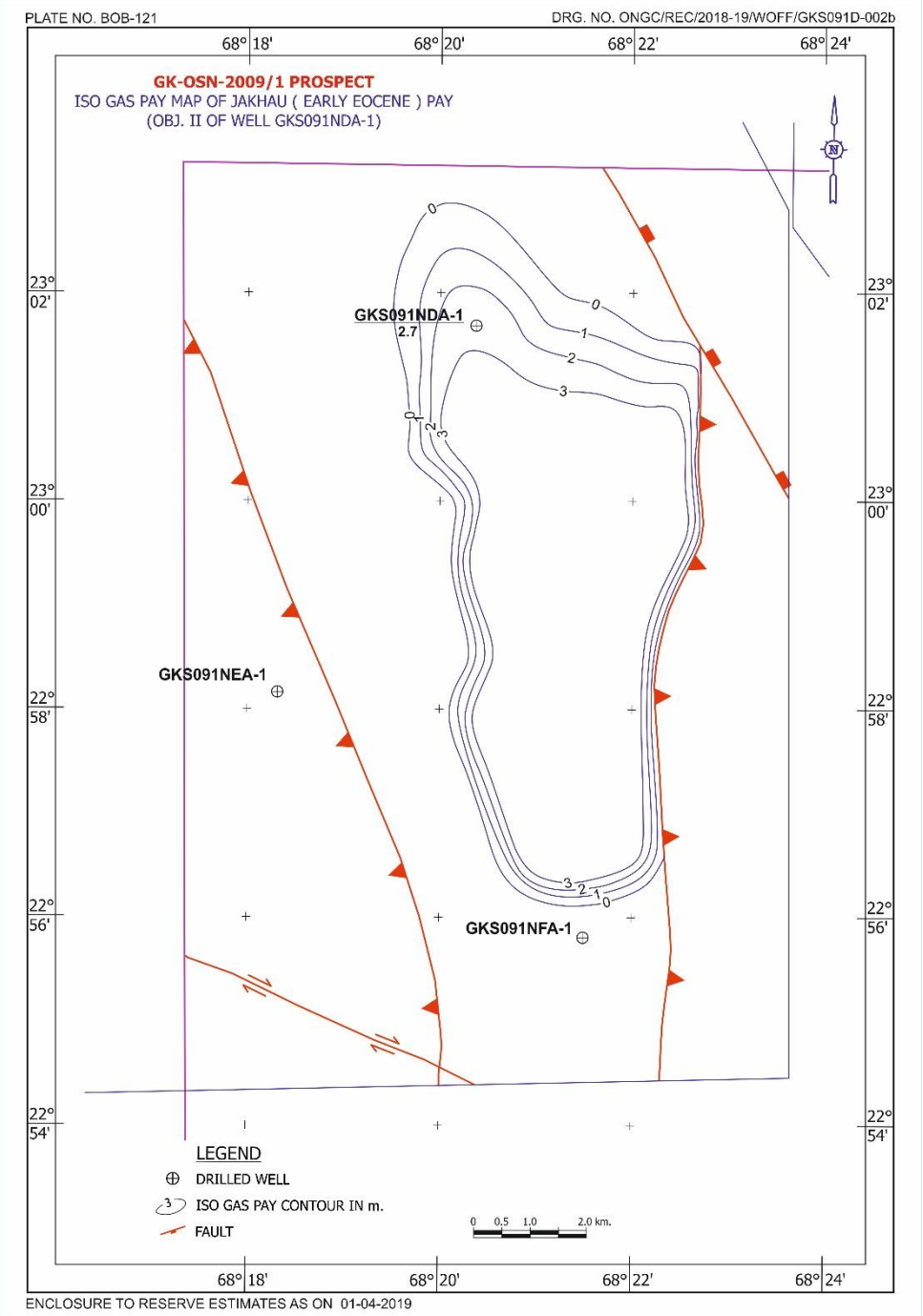


Figure 4-21: Iso pay map of Jakhau Formation, Object-II (GKS091NDA-1)



4.2.6 Reservoir parameters and hydrocarbon estimates (GKS091NDA-1)

The estimates of hydrocarbon in-place have been worked out under various field assumptions. All inputs and results, as available are presented in the following section.

Petrophysical parameters and wellbore estimates:

Earlier operator submitted the Declaration of Commerciality (DoC) for the Block GK-OSN-2009/1 for the discoveries GKS091NDA-1 & GKS091NFA-1 is available.

Early Eocene SII Pay (Object II- 1485-1482m, well GKS091NDA-1)

The parameters used are Φ- 27%, He 2.14m, Sg-43% with a total area of 46.186 SKM. The Gas Formation Volume Factor (Bg) of 0.007787 calculated for gas in well GKS091NDA-1 (Object II) has been used for volume estimation.

Table 4-23: GKS091NDA-1 volumetrics

Well	Pay	O+OEG (MMTOE)
GKS091 NDA-1	Early Eocene SII	**1.47**

Erstwhile Operator-reported estimates on record:

The GKS091NDA-1 has a reported gas estimate of **1.64 MMTOE**.

All these hydrocarbon estimates are subject to future assessments based on Operator's own technical insights and additional information/data, which may warrant possible revision of the currently reported estimates.

4.2.7 Production Facility for Oil and Gas Evacuation:

Production facilities for Oil & Gas Evacuation are summarized in Table 4-24.

Table 4-24: GKS091NDA-1 Production facility for Oil & Gas Evacuation

Sl No	Discovery Name	Basin	Water Depth (mtr)	Oil/Gas	Initial Testing details Gas Rate	Pay sand	Depth of discovered reservoir (TVDSS)	Near-by surface Facility with distance
1	GK-1 (GKS092NAA-1)	Kutch Shallow Offshore	3.5	Gas	Qg=115168 m3/d through ½" choke		898-902 mtr	Upcoming SunPetro Dwarka Onshore Terminal (GK-28) : 120 KM.Cairn Suvali Plant: 489 KM
2	GKOSN-2009/1-D (GKS091NDA-1)	Kutch Shallow Offshore	18	Gas	1,80,000 m3/d	Jakhau (Jakhau & Early Eocene)	1450m	No Facility exists in the region. Planned for evacuation to Dwarka
3	GKS091NFA-1 (GKS091NFA-1)	Kutch Shallow Offshore	19	Gas	2,36,524 m3/d	Weathered Dolerite (Naliya & Mid Cretaceous)	3770m	No Facility exists in the region (Planned for evacuation to Dwarka)
4	GK-OSN-2010-1-A(GKS101NAA-1)	Kutch Shallow Offshore	16	Gas	45,873 m3/d through 1/2" choke, FTHP 250psi	Jakhau (Jakhau & Early Eocene)	1260m	No Facility exists in the region (Planned for evacuation to Dwarka)
5	GK-OSN-2010-1-C (GKS101NCA-1)	Kutch Shallow Offshore	32	Gas	1,63,000 m3/d	Chhasra FM (Chhasra & Mid Miocene)	880m	No Facility exists in the region (Planned for evacuation to Dwarka)
6	GSOSN-2004/1-A (GSS041NAA-1)	Kutch Shallow Offshore	99	Gas	35,597 m3/d (3/8")	Jhuran & Late Jurassic	4370m	Dwarka-115 KM
7	GSS041NAA-B (GSS041NAA-2)	Kutch Shallow Offshore	92	Gas	1,56,563 m3/d	Bhuj & Early Cretaceous	4370m	Dwarka-115 KM

4.2.8 Status of Additional Wells in the area (GKOSN Polygon)

In GKOSN polygon, there are 14 wells drilled (GK-1-1, GK-1-2, GK-22C-1, GK-22C-2, GK-22C-3, GK-3-1, GK-40-1, GKS091NDA-1, GKS091NEA-1, GKS091NFA-1,GKS101NAA-1, GKS101NCA-1, GKS101NDA-1, GKS101NFA-1) of which GKS091NDA-1, GKS091NFA-1, GKS101NAA-1, GKS101NCA-1 are discovery wells. Additionally, GK-22C-1 also produced gas during initial testing. Data of all the wells other than discovery wells are given at 4.8

4.2.9 Main reports available for discovery well GKS091NDA-1

- Well Completion Report (WCR), October 2015
- Formation Evaluation report (FER), September 2015
- Reservoir Study Report, January 2015
- PVT Report of MDT sample, December 2014
- Production Testing report, March 2015
- Gas Analysis Report, February 2015
- Core Report, CC-1
- SWC Report

GK/OSDSF/GKOSN/2025 GKS091NFA-1 FIELD

4.3 DESCRIPTION OF KUTCH OFFSHORE GKS091NFA-1 (GK-OSN-2009/1)

GKS091NFA-1 was drilled in an NELP Block GK-OSN-2009/1 with an objective to appraise the Early Eocene (S-I and S-II pays) and to explore the hydrocarbon prospectivity of Middle Miocene, Paleocene, Trap and Mesozoic with a target depth of 3835m. GKS091NFA-1 and was drilled upto 3865m and drilling was terminated in Dolerite Intrusive body within Mesozoic Naliya Formation. The well has penetrated the Tertiary sequences of Chhasra, Godhra, Narayan Sarovar, Fulra, Jakhau, Nakhatrana and the Mesozoic sequences of Deccan Trap, Naliya with doleritic intrusive bodies.

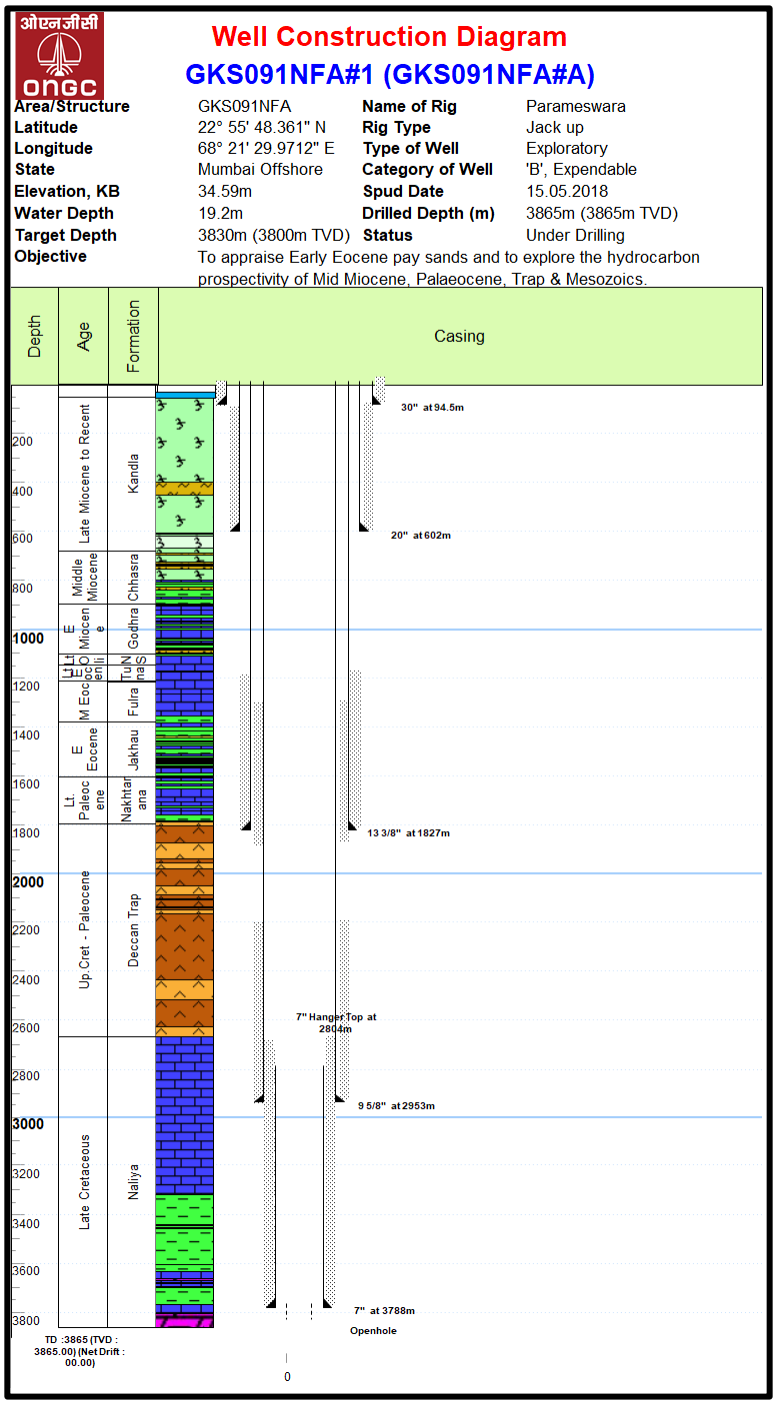
The well GKS091NFA-1 is located south of discovery GKS091NDA-1 in which two objects were tested. In GKS091NDA-1, Object-I in the interval 1593.5-1595m flowed little gas with BSW of around 58% whereas Object-II in the interval 1482-1485m (Jakhau Sandstone) flowed gas @1,94,360 m3/day through 32/64" choke at FTHP of 1580 psi.

Well GK-22C-1, which is situated further north of GKS091NDA-1, flowed gas @ 2,80,850 m3/day from Early Cretaceous Bhuj Sandstone (2840-2845m). Other nearby hydrocarbon producing wells are in GK-28 & 42 area which are located South East of this block and have gas discoveries from Tertiary Formations (Middle Miocene, Early Eocene and Paleocene) & well GK-28-2 flowed Oil from sandstones of Cretaceous age. The cluster GK-28 & 42 have been awarded under DSF-III and is currently under development. There are two gas discoveries (GKS101NAA-1 & GKS101NCA-1) in the earlier NELP Block GKS-OSN-2010/1, which is located south of this discovery GKS091NFA-1. The discoveries of the Block GK-OSN-2010/1 are also part of this GKSN Polygon under current DSF-IV offer.

4.3.1 Drilling and Well completion

In the cluster GKOSN polygon, there are four discoveries GKS091NDA-1, GKS091NFA-1, GKS101NAA-1 & GKS101NCA-1 and there are 10 additional wells drilled in this polygon of the contract area. Key information of the well GKS091NFA-1 has been collated and presented hereunder. This includes the Well Construction Diagram (Figure 4-22).

Figure 4-22: Well construction Diagram of Well GKS091NFA-1



4.3.2 Well Logging and Formation Evaluation

The well logs of discovery well GKS091NFA-1 along with some key wells in the contract area have been reviewed. The logs recorded in various open-hole sections along with cased-hole logs and information of conventional and other wireline formation test data are presented in this docket.

The availability of key input reports like Well Completion Reports (WCR), Formation Evaluation Report (FER) and Declaration of Discovery for the Block GK-OSN-2009/1 have been checked and information given. Reservoir parameters of interesting zones and results of the tested zone(s) have been included in this report. Log motifs of tested/ interesting zone of key wells are also appended (refer to Figure 4-23 - Figure 4-31).

A) Well completion and log evaluation reports availability (GKS091NFA-1)

WCR/ FER availability	Spud date	KB	Drilled depth/Water Depth
Only WCR available	15.05.2018	34.59m	3865m/19.2m

B) Well logs acquired (GKS091NFA-1)

Logs were recorded in the well GKS091NFA-1 are as given below

Sl. No.		Run	Date	Interval (m)		Data Recorded
				From	To	
1	8 ½" X 17 ½"	1A	07-Jun-2018 - 08-Jun-2018	602.00	1832.90	PEX-AIT- HNGS
2		1B	08-Jun-2018 - 08-Jun-2018	602.00	1831.50	CMR-ECS
3		1C	08-Jun-2018 - 10-Jun-2018	926.60	1788.00	MDT
4		1D	10-Jun-2018 - 10-Jun-2018	909.50	1822.50	MSCT
5		1E	10-Jun-2018 - 10-Jun-2018	602.00	1820.00	DSI
6	**12 ¼"**	2A	16-Aug-2018 - 16-Aug-2018	1828.0	2963.0	PEX-AIT- HNGS
7		2B	16-Aug-2018 - 17-Aug-2018	1828.0	2963.0	DSI-GR
8	**8 ½"**	3A	17-Sep-2018 to 18-Sep-2018	2958.0	3870.2	PEX-AIT- HNGS
9		3B	18-Sep-2018 to 19-Sep-2018	2958.0	3861.43	CMR-ECS

10		3C	21-Sep-2018 to 22-Sep-2018	2958	3853	OBMI-UBI-DSI
11		3D	22-Sep-2018 to 22-Sep-2018	3570	3867	MSCT-GR
12	7" Liner	4A	08-Oct-2018 to 08-Oct-2018	2809.5	3790	CBL-VDL-GR- CCL
13	9 5/8 " Casing	4B	08-Oct-2018 to 09-Oct-2018	1828	2802	CBL-VDL-GR- CCL
14	8 ½" & 7" Cased Hole	4C	09-Oct-2018 to 10-Oct-2018	1501.30	3525	VSP-GR
15		8A	29-Oct-2018 to 30-Oct-2018	2741.1	3860	VSP-GR
16		8B	30-Oct-2018 to 30-Oct-2018	2920	3866	SONIC SCANNER
17	**9 5/8"**	8C	30-Oct-2018 to 31-Oct-2018	1400	2805	USIT-CBL- VDL-GR-CCL

Major Petrophysical results of GKS091NFA-1 are presented in Table 4-25.

Table 4-25: GKS091NFA-1 key petrophysical properties

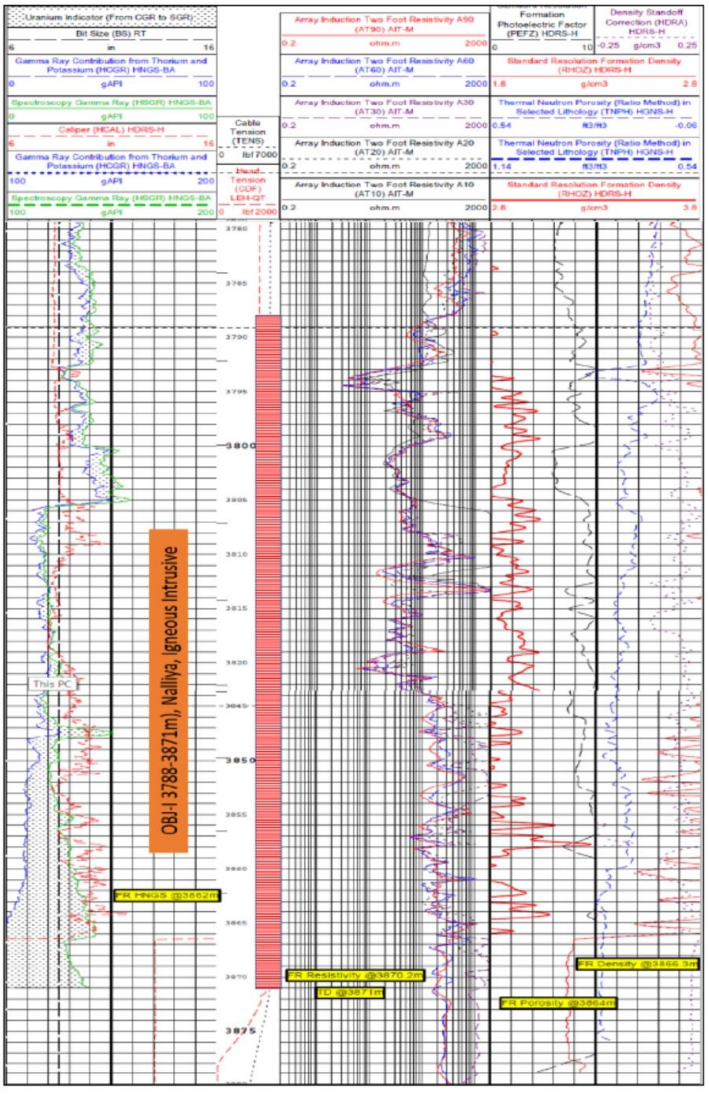
Object		V shale	Saturation	Porosity	Resistivity	Effective Pay Thickness (He)
		m3/m3	%	%	Ohm-m	m
Object I (Barefoot testing)	3871-3788	-	-	-	20-150	33
Object II	3782-3775	-	-	-	400	-
Object III	2434-2426	-	-	-	100-1000	-
	2356-2366	-	-	-	10-30	-
	2333-2345	-	-	-	2-10	-
Object IV	1788.5-1786	0.7585	50	26	36.07	2
Object V	1669-1666.5	0.0012	45	20	4.44	5
Object VI	1631.5-1629.5	0.0371	35	22	2.32	1.5
	1576 - 1570.5m	0.054705	20	20	1.68	3

Summarized Testing results of well GKS091NFA-1 are presented in Table 4-26.

Table 4-26: GKS091NFA-1 - Test results summary

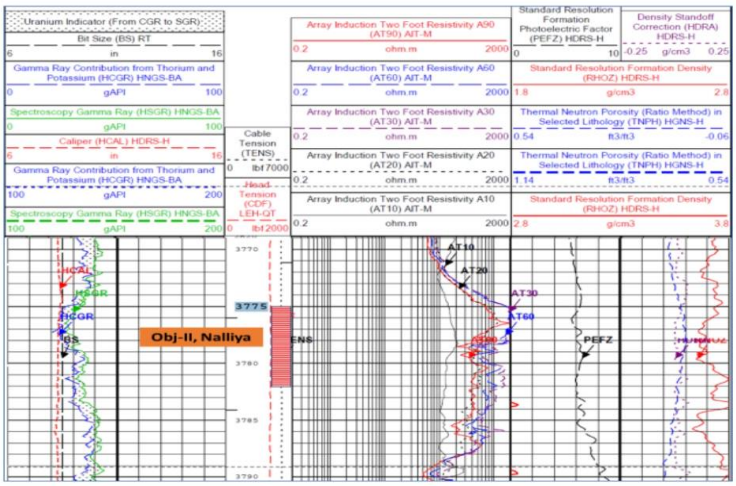
Well No	Obj. No	Interval / (Pay zone)	Testing Results
GKS091NFA-1	I	3871-3788m	Flowed Gas at rate of 2,62,199 m^3/day
	II	3782-3775m	Gas Indications
		2434-2436m,	
	III	2366-2356,	Gas Indications
		2345-2333m	
	IV	1788.5-1786m	Flowed Gas at rate of 1,60,504m^3/day
	V	1669-1666.5m	Flowed Gas at rate of 1,02,206m^3/day
		1662.5-1659.5m	
		1631.5-1629.5	Not perforated
	VI	1576-1570.5m	Flowed Gas and water. Qgas 68,272m^3/day and Q water - 111 BPD. Object was tested behind two casings and the cement bond is expected to be poor. Thus the water production is inferred from water layer below the tested interval)

Figure 4-23: Log Motif of GKS091NFA-1 Obj. I at 3788-3871m



Log Signature of Object-I (3788-3871m)

Figure 4-24: Log Motif of GKS091NFA-1 Obj. II at 3775-3782m



Log Signature of Object-II (3775-3782 m)

Figure 4-25: Log Motif of GKS091NFA-1 Obj. III at 2434-2436m

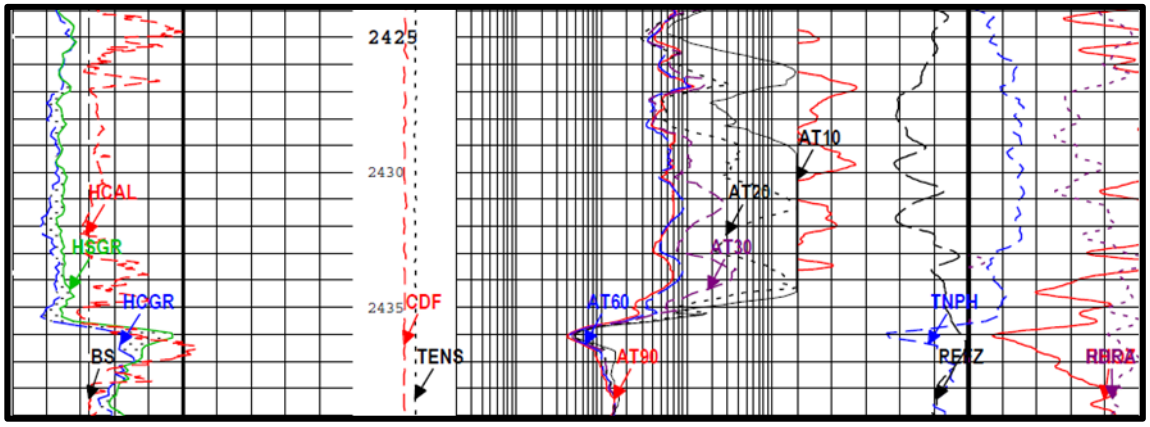


Figure 4-26: Log Motif of GKS091NFA-1 Obj. III at 2356-2366m

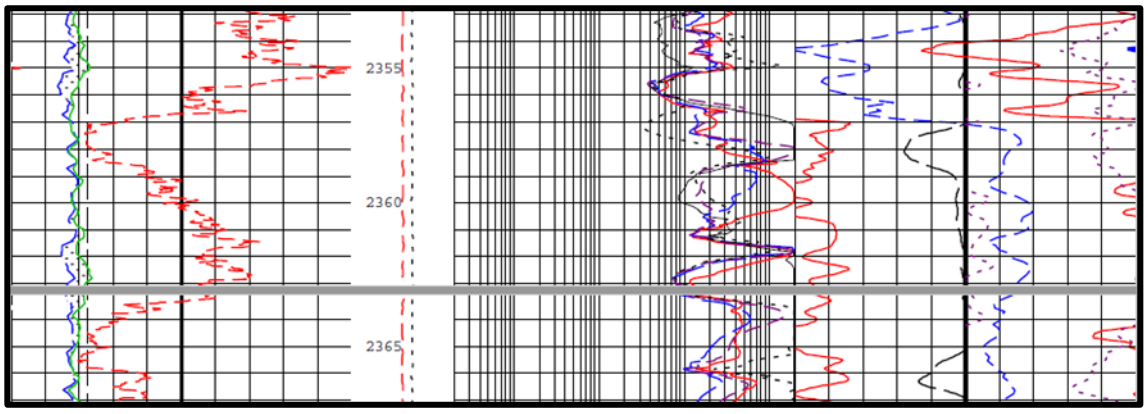


Figure 4-27: Log Motif of GKS091NFA-1 Obj. III at 2333-2345m

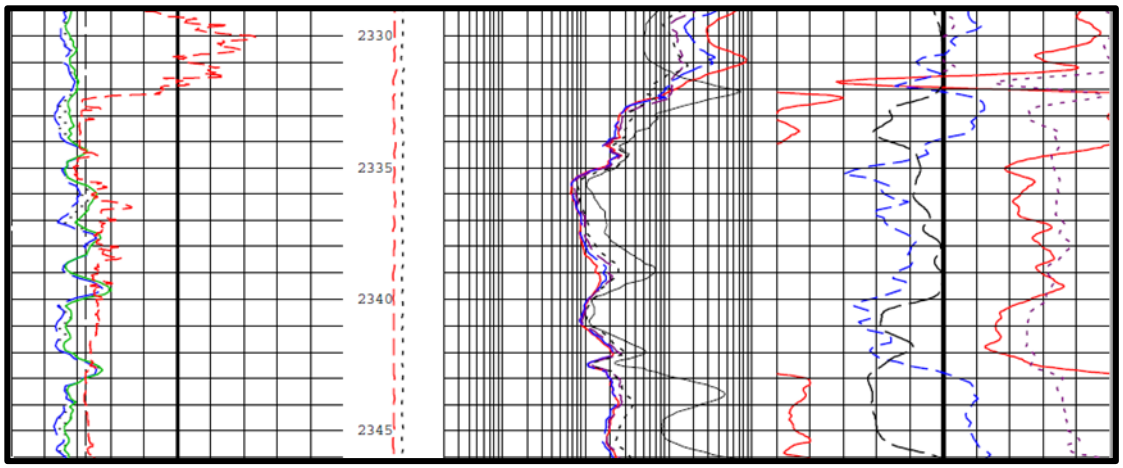


Figure 4-28: Log Motif of GKS091NFA-1 Obj. IV at 1788.5-1786m

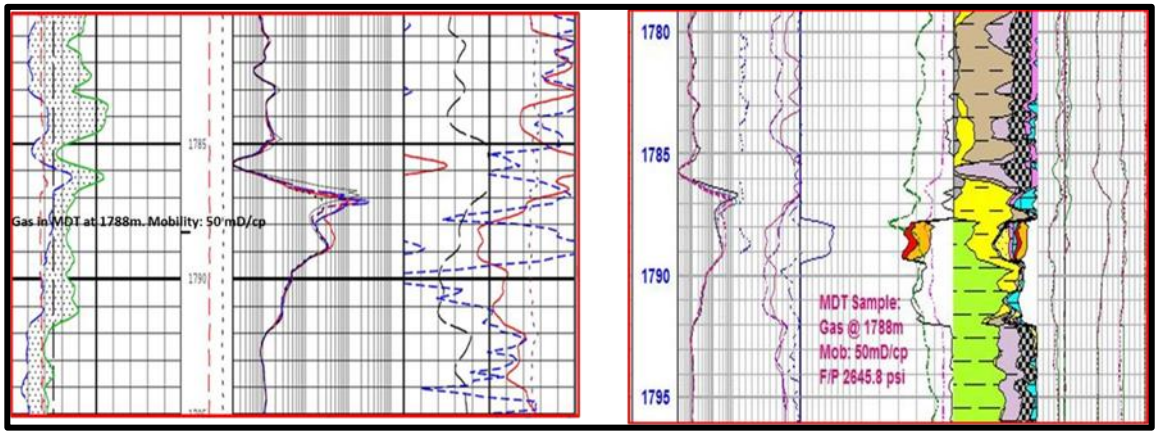


Figure 4-29: Log Motif of GKS091NFA-1 Obj. V at 1669-1666.5m

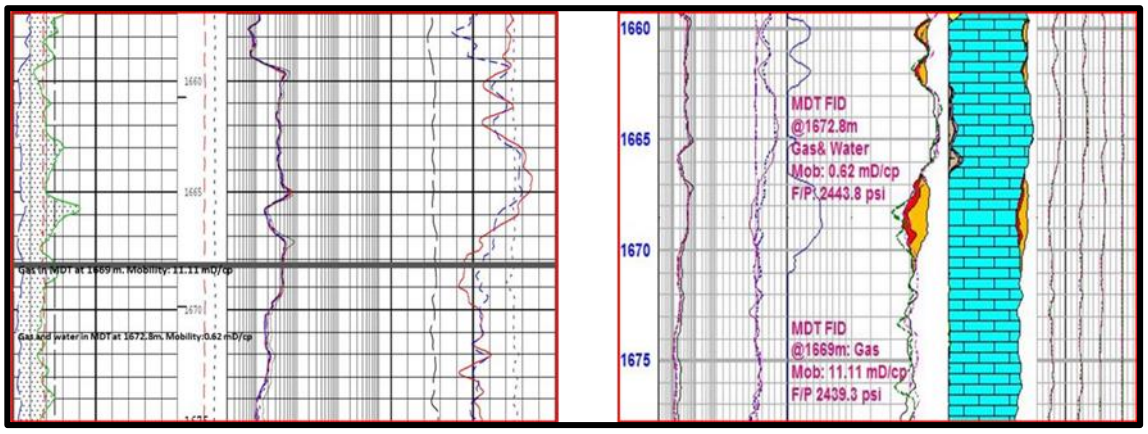


Figure 4-30: Log Motif of GKS091NFA-1 Obj. VI at 1631.5-1629.5m

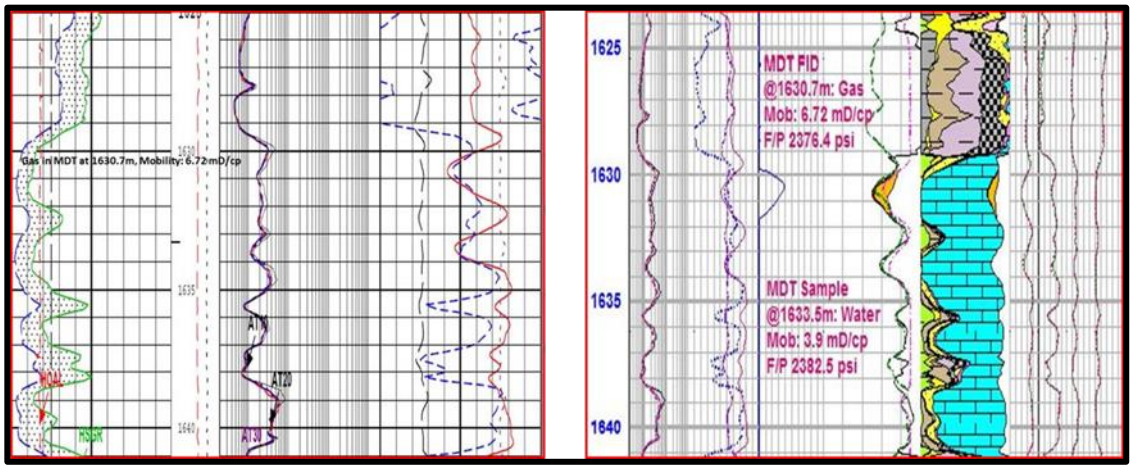
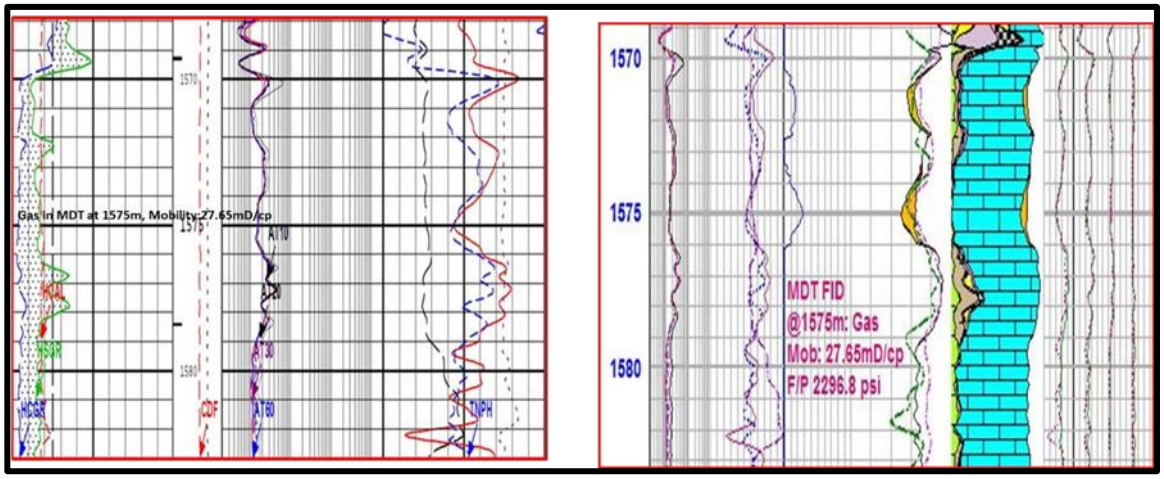


Figure 4-31: Log Motif of GKS091NFA-1 Obj. VI 1576-1570.5m



4.3.3 Well testing and workover history

Six objects were identified for production testing. Four objects flowed gas. Object I (Table 4.6, 4.7) flowed gas from Igneous intrusive and Objects IV (table 4.8 & 4.9), Object V (Table 4.10 & 4.11) and Object VI (Table 4.12 & 4.13), produced gas from Nakhtarana Formation. Detailed testing results are given below

Object-I (3871.0-3788.0m)

Object-I was tested with TCP-DST in the interval 3871.0-3788.0m and it produced gas (refer to Table 4-27).

Table 4-27: GKS091NFA-1 DST-TCP well test results for Object-I

Object No & interval	Bean Size (")	FTHP (PSI)	FTHT (˚F)	Qgas (m3/day)	Qliquid (bbl/day	STHP (PSI)	Remarks
Object I 3871-3788m	1/2 "	1950	182	2,62,199	_		
						6300	15.5hrs surface buildup
	3/8"	2300	155	1,82,325			
	1/4"	3600	143	1,27,515			
	1/8"	4950	104	44,308			
						5250	76.5hrs surface buildup
	1/2"			1,52,295			
						4900	51.5hrs surface buildup

Object II (3782-3775m), Naliya formation

The well was tested in Naliya Limestone through TCP-DST. On testing it gave Gas Indications. The reverse sample contains water of salinity 13200 ppm as NaCl. Reverse out gas sample contain C1 of the order of 53.7%

Object III (2434-2426m, 2356-2366m, 2333-2345m), Trap/Basalt

The well was tested in Basalt/Trap and was tested through TCP-DST. It gave Indications of gas.

Object IV (1788.5-1786m), Nakhtrana Weathered Basalt, Siltstone

The well was tested through TCP-DST and it flowed Gas (refer to Table 4-28).

Table 4-28: GKS091NFA-1 DST-TCP well test results for Object-IV

Choke (inch)	Gas (m^3/day)	Condensate (bbls/day)	FTHP (psi)	FTHT (°F)	Condensate API@60°F	Remarks
32/64	160504	-	1000	99	-	Well flowed gas & traces of liquid (not measurable).
24/64	125674	-	1400	88	-	Well flowed gas & traces of liquid (not measurable).
32/64	157602	-	1000	94	-	Well flowed gas & traces of liquid (not measurable).
40/64	171562	-	750	98	-	Well flowed gas & traces of liquid (not measurable).

Object V(1669-1666.5m,1662.5-1659.5m), Nakhtrana Limestone

The well was tested in Nakhtrana Limestone through TCP-DST. The well flowed gas and detailed testing results are presented in Table 4-29.

Table 4-29: GKS091NFA-1 DST-TCP well test results for Object-V

Choke (Inch)	Gas (m^3/day)	FTHP (psi)	FTHT (°F)	Remarks
32/64	1,02,206	650	89	Well flowed gas & traces of liquid (not measurable).
24/64	90,241	1000	80	Well flowed gas & traces of liquid (not measurable).
32/64	1,00,515	650	85	Well flowed gas & traces of liquid (not measurable).

40/64	1,06,156	450	92	Well flowed gas with water (Q**water**- 57 BPD); and traces of condensate (not measurable)
48/64	1,07,260	300	92	Well flowed gas with water (Q**water**- 96 BPD);; and traces of condensate (not measurable)

Object VI (1576-1570.5m) Nakhatrana Limestone

The well was tested in Nakhtarana Formation with TCP-DST and produced gas. Detailed testing results are presented in Table 4-30.

Table 4-30: GKS091NFA-1 DST-TCP well test results for Object-VI

Choke	Gas (m3/day)	FTHP (psi)	FTHT (°F)	Remarks
32/64	68272	500	88	Well flowed gas with water (Qwater-111 BPD)
32/64	64373	475	88	Well flowed gas with water (Qwater-108 BPD)
16/64	38091	1225 - 1250	76	Well flowed gas with water (Qwater-64 BPD)
24/64	54439	750	84	Well flowed gas with water (Qwater-84 BPD)
32/64	58798	440	88	Well flowed gas with water (Qwater-140 BPD)
40/64	60537	260	94	Well flowed gas with water (Qwater-159 BPD)

4.3.4 Reservoir Engineering studies and analysis

Key reservoir engineering datasets, wherever available have been collated and presented under various data genres. In a comprehensive data presentation, the results are included from well tests, formation dynamics tests, reservoir pressure build-up study and PVT data/ results.

4.3.4.1 Formation dynamics tests (GKS091NFA-1)

Pressure points were recorded in 8 1/2" Pilot hole for 17 1/2" hole through wireline and the details are presented in Table 4-31.

Table 4-31: GKS091NFA-1 – MDT formation test in 8 1/2" Pilot hole for 17 1/2" hole through wireline

Depth MDKB (m)	Depth TVDSS (m)	Mud Hydrostatic Pressure (psi)	Formation Pressure (psi)	Mobility (md/cp)	Temp (°F)	Sampling/ FID/ Remarks
1669.00	1634.41	2918.42	2439.30	11.11	186.21	FID-Gas
1671.00	1636.41	2920.29	2453.20	0.99	189.25	
1671.50	1636.91	2921.22	NA	NA	189.85	
1674.00	1639.41	2925.66	2447.90	0.83	190.64	
1675.00	1640.41	2925.66	2464.03	0.69	190.95	
1677.80	1643.21	2932.57	2454.74	1.66	191.92	Could not sustain pumping because of Low mobility
1672.80	1638.21	2924.58	2443.87	0.62	191.28	FID-Gas Water Transition Zone
1662.00	1627.41	2905.31	2443.95	0.80	193.49	Could not sustain pumping because of Low mobility
1663.00	1628.41	2907.52	NA	NA	193.07	
1660.00	1625.41	2902.02	2453.96	0.16	193.36	
1659.50	1624.91	2901.63	NA	NA	193.23	
1788.00	1753.41	3123.15	2645.81	49.77	199.14	Sample taken in MPSR#3314

1747.40	1712.81	3053.79	NA	NA	199.98	
1747.50	1712.91	3053.91	NA	NA	199.92	
1747.30	1712.71	3053.20	NA	NA	199.83	
1747.60	1713.01	3054.04	NA	NA	199.60	
1630.70	1596.11	2852.56	2376.44	6.72	187.93	FID-Gas
1633.60	1599.01	2857.77	NA	NA	189.61	
1633.50	1598.91	2857.46	2382.49	3.91	191.54	Sample Collected in MRSC #483
1575.00	1540.41	2757.02	2296.85	27.70	182.18	FID Gas
1580.90	1546.31	2766.85	NA	NA	183.18	
1580.80	1546.21	2766.58	NA	NA	184.43	
1579.40	1544.81	2764.20	NA	NA	185.12	
1584.70	1550.11	2773.25	NA	NA	185.69	
1584.60	1550.01	2773.26	NA	NA	185.78	
1543.20	1508.61	2702.20	2237.56	1056.93	182.41	FID-water
1440.20	1405.61	2524.87	2185.10	0.57	178.89	
1440.10	1405.51	2524.99	NA	NA	177.56	
1439.50	1404.91	2523.95	NA	NA	176.59	
1296.60	1262.01	2275.46	NA	NA	167.66	
1296.70	1262.11	2275.42	NA	NA	165.72	
1296.50	1261.91	2275.05	NA	NA	164.23	
1286.30	1251.71	2257.30	NA	NA	162.88	
1286.40	1251.81	2257.52	NA	NA	163.07	
1292.80	1258.21	2268.82	NA	NA	162.96	
1292.90	1258.31	2268.89	NA	NA	162.81	
1274.50	1239.91	2236.93	NA	NA	162.43	
1274.40	1239.81	2236.66	NA	NA	161.85	
1254.30	1219.71	2201.57	NA	NA	160.91	
1254.40	1219.81	2201.87	NA	NA	160.04	
927.70	893.11	1631.42	NA	NA	149.60	
927.30	892.71	1630.66	NA	NA	146.47	
926.60	892.01	1629.45	NA	NA	145.02	
926.70	892.11	1629.59	NA	NA	144.65	

4.3.4.2 Pressure Transient & Pressure Build up study (GKS091NFA-1)

Pressure transient study has been done for all the six objects. Summary of pressure build up and bean study is as given below

Object-I (3871.0-3788.0m)

Pressure Build up study was carried out and summary of results are presented in Figure 4-32 and Figure 4-33.

Figure 4-32: GKS091NFA-1 Pressure Build-up Plot (Obj-I)

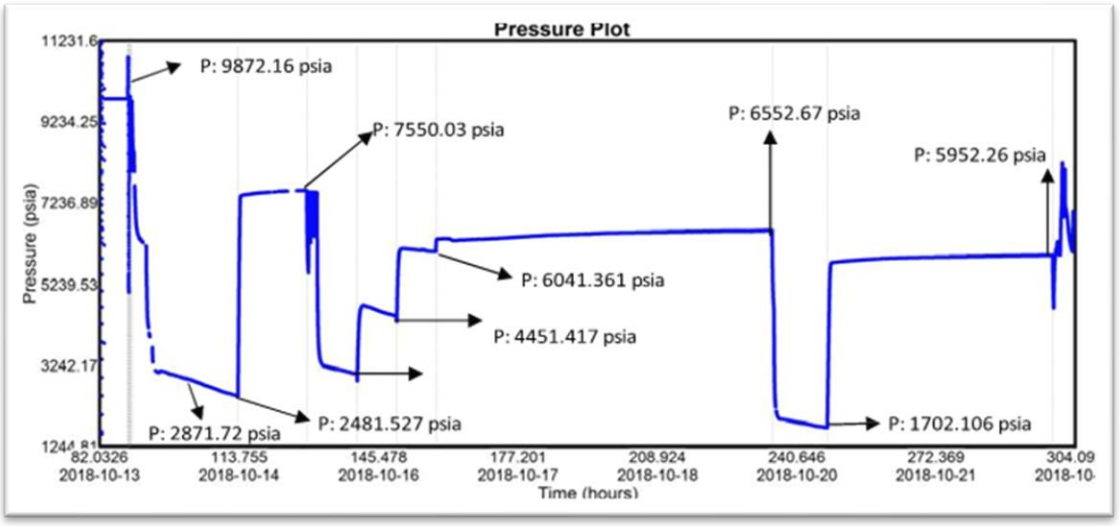
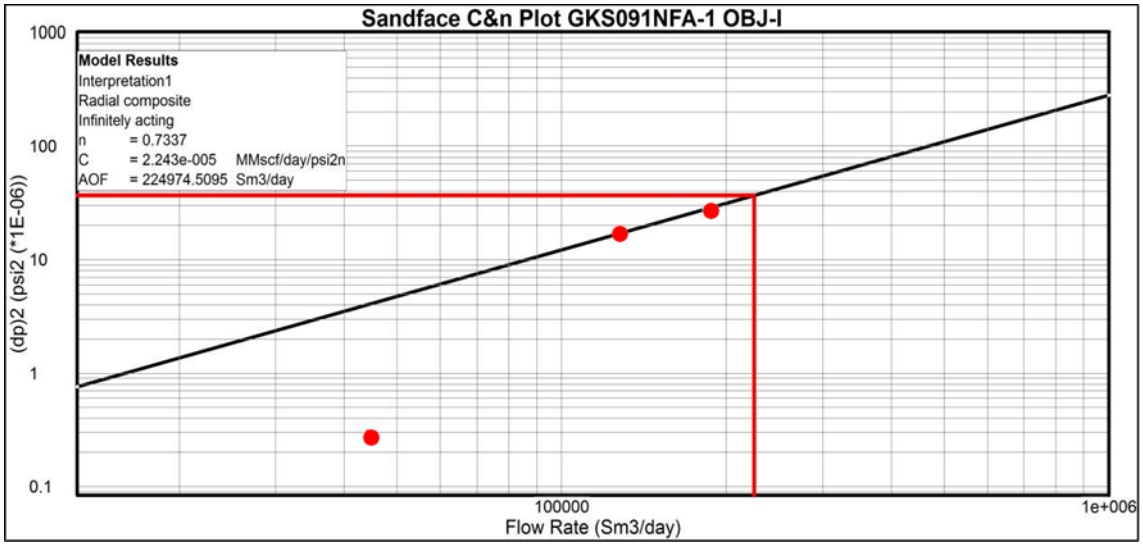


Figure 4-33: GKS091NFA-1 Sandface C&n Plot (Obj-I)



Major results of the interpretation are presented in Table 4-32.

Table 4-32: GKS091NFA-1 – Pressure Build-up interpretation parameters, Object-I

Parameter	Results
Permeability (md)	2.55
Skin Factor	52.12
Current Simulated average reservoir pressure	6182.8
AOFP	2.24 x 10^5 m_3/Day.

Object IV (1788.5-1786m), Nakhtrana Weathered Basalt, Siltstone

Pressure Build up study was carried out and results are presented in Figure 4-34 - Figure 4-35 and summarized in Table 4-33.

Figure 4-34: GKS091NFA-1 Pressure Build-up Plot (Obj-IV)

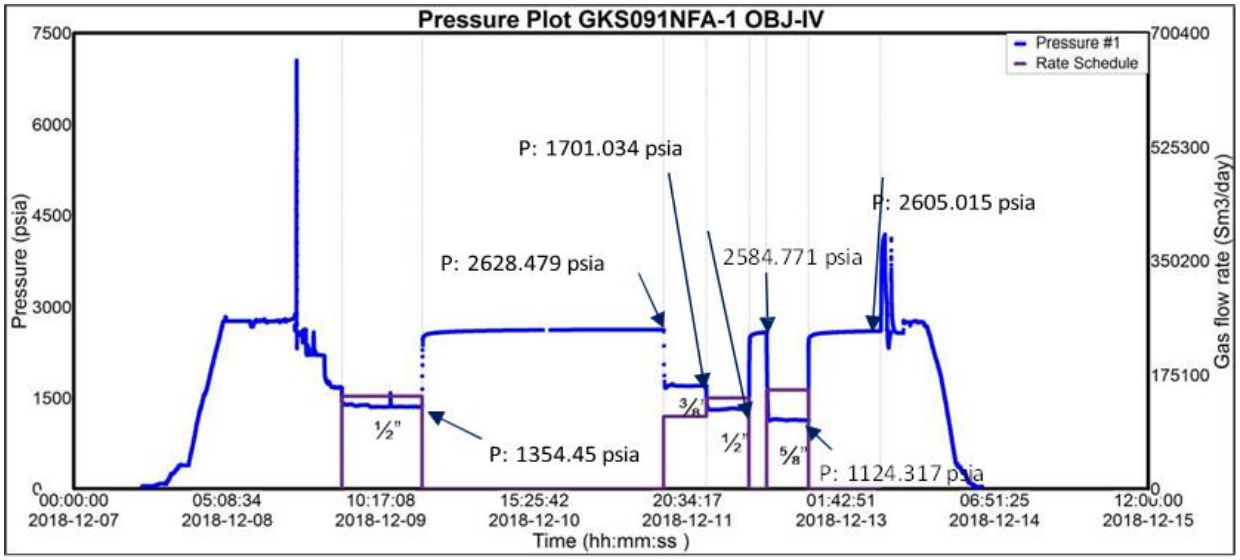


Figure 4-35: GKS091NFA-1 Sandface C&n Plot (Obj-IV)

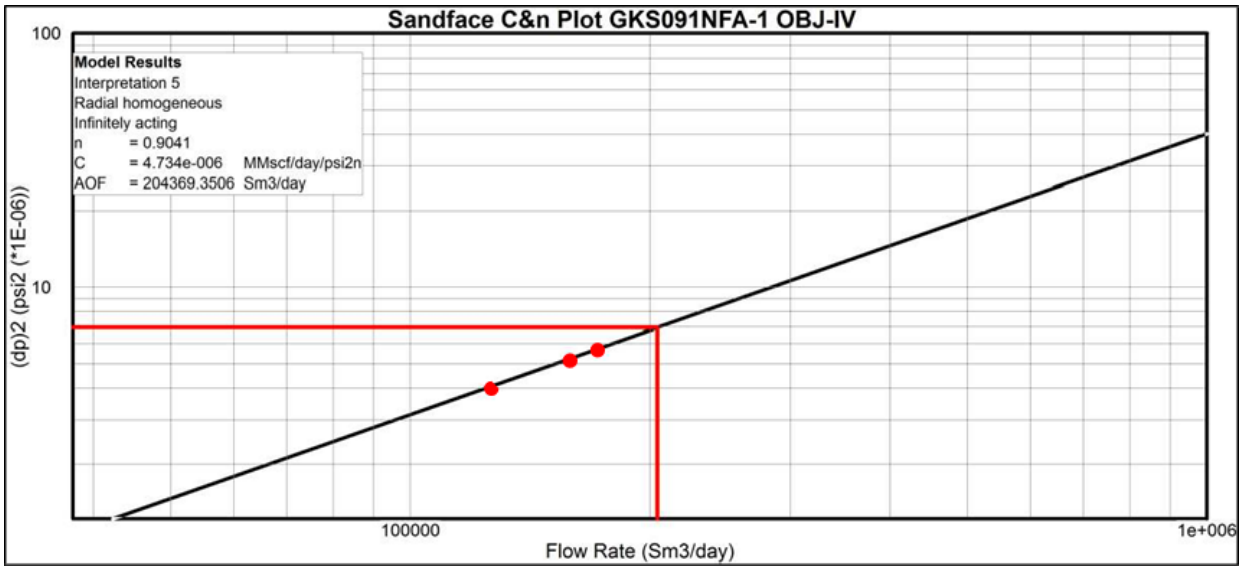


Table 4-33: GKS091NFA-1 – Pressure Build-up interpretation parameters, Object-IV

Parameter	Results
Permeability of Zone 1 (md)	41.3
Total Skin factor	10.2
Radius of investigation (ft)	4548.5
Permeability of Zone 2 (mD)	47.5
Permeability of Zone 3	30.5
Permeability of Zone 4	48.1
Extrapolated Reservoir Pressure, P* (psia)	2635.1
AOFP, m3/day	204369

Object V(1669-1666.5m,1662.5-1659.5m), Nakhtrana Limestone

Pressure transient study was carried out and the results of the study are presented in Figure 4-36 - Figure 4-37 and summarized in Table 4-34.

Figure 4-36: GKS091NFA-1 Pressure Build-up Plot (Obj-V)

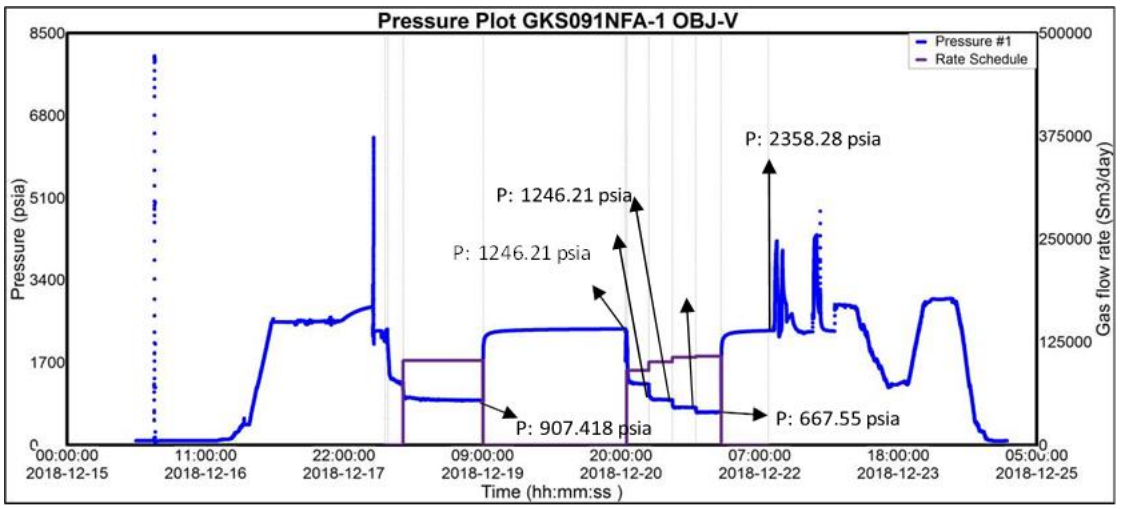


Figure 4-37: GKS091NFA-1 Sandface C&n Plot (Obj-V)

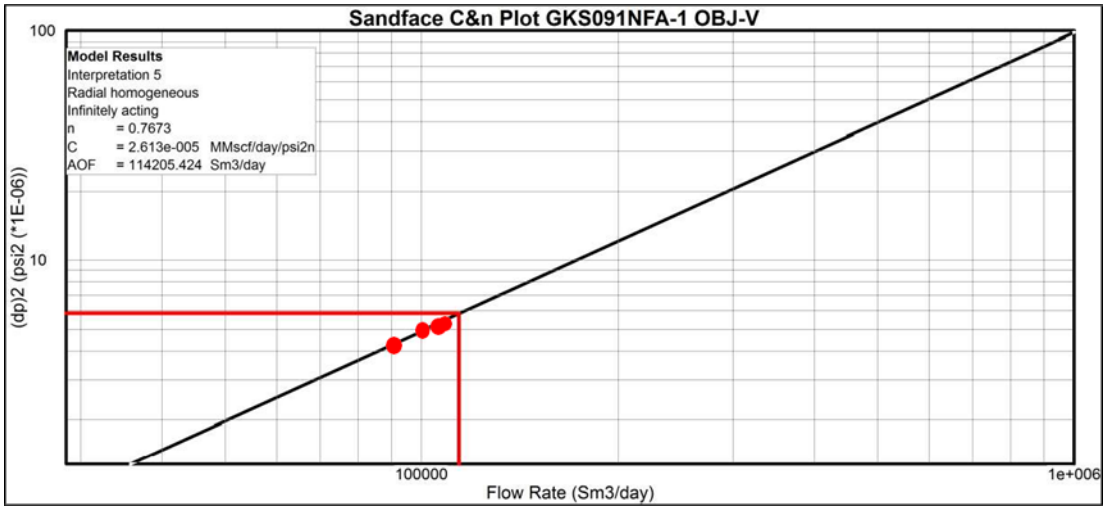


Table 4-34: GKS091NFA-1 – Pressure Build-up interpretation parameters, Object-V

Parameter	Remarks
Permeability of Zone 1 (md)	4.4
Total Skin factor	2.01
Radius of investigation (ft)	460
Permeability of Zone 2 (mD)	9.5
Permeability of Zone 3 (mD)	5.5
Extrapolated reservoir Pressure P* (psia)	2411.2
AOFP, m3/day	114205.4

Object VI (1576-1570.5m) Nakhatrana Limestone

The well was tested in Nakhtarana Formation with TCP-DST and detailed Pressure Transient was carried out and results are presented in Figure 4-38 - Figure 4-39 and summarized in Table 4-35.

Figure 4-38: GKS091NFA-1 Pressure Build-up Plot (Obj-VI)

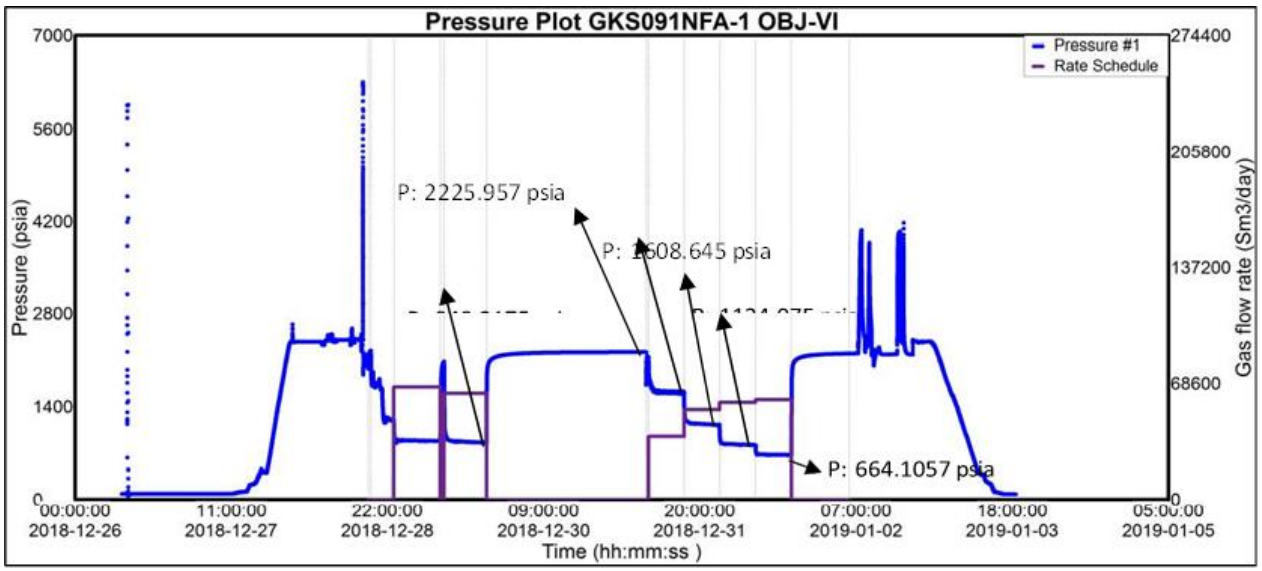


Figure 4-39: GKS091NFA-1 Sandface C&n Plot (Obj-VI)

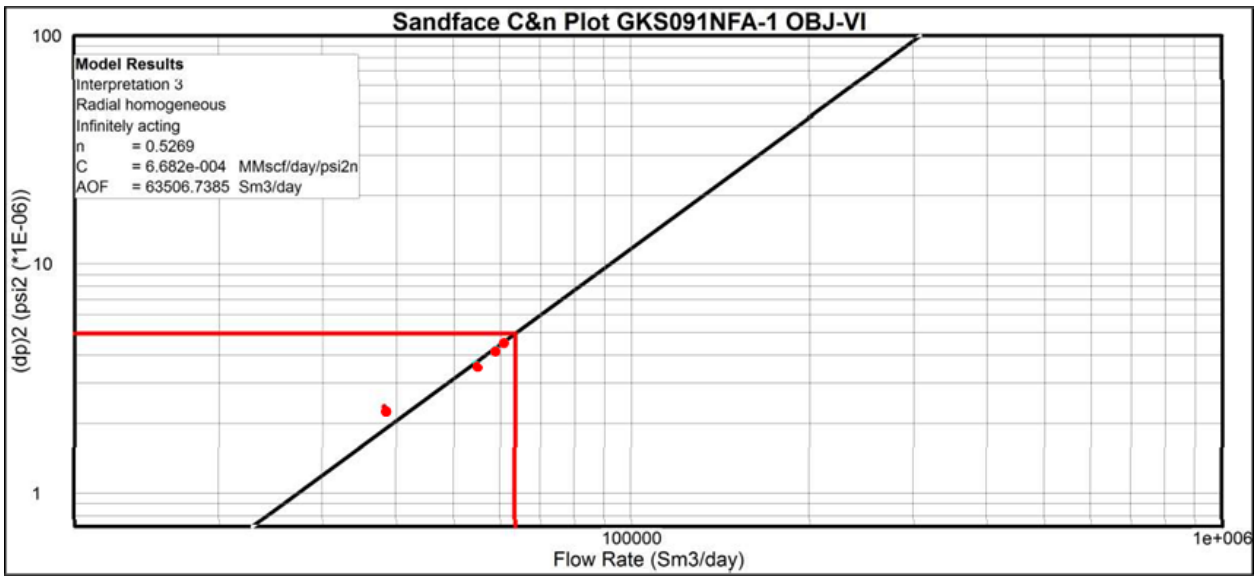


Table 4-35: GKS091NFA-1 – Pressure Build-up interpretation parameters, Object-VI

Parameter	Results
Permeability (mD)	6.8
Mechanical Skin factor	2.32
Flow capacity kh (md.ft)	66.929
Vertical Permeability (kz):	0.0034
Radius of investigation (ft)	5278.1923
Pseudo radial skin, (Spr)	7.6763
Extrapolated Reservoir Pressure P* (psia)	2232.3841
AOFP, m3/day	63506

4.3.4.3 Gas Analysis (GKS091NFA-1)

Gas composition analysis was carried out in all the producing objects and results are summarized in Table 4-36 - Table 4-39.

Table 4-36: GKS091NFA-1 – Gas composition, Object-I

Object-I 3871-3788m	
Gas Composition	Volume percentage
Methane	89.24
Ethane	0.10
Propane	0.01
i-Butane	0.00
n-Butane	0.00
i-Pentane	0.00
n-Pentane	0.00
Hexanes	0.02
Carbon dioxide	8.72
N2	1.91
He (in ppm)	BDL
H2S (in ppm)	BDL
Mol. Wt.	18.74
Sp.gravity	0.6402
Net Calorific Value (Kcal/m3)	7276

Table 4-37: GKS091NFA-1 – Gas composition, Object-IV

Object-IV 1786-1788.5m	
Gas Composition	Volume percentage
Methane	95.65
Ethane	0.60
Propane	0.19
i-Butane	0.04
n-Butane	0.05
i-Pentane	0.02
n-Pentane	0.02
Hexanes	0.18
Nitrogen	3.16
Carbon dioxide	0.09
He (in ppm)	BDL
H2S (in ppm)	BDL
Mol. Wt.	16.77
Sp.gravity	0.5799
Net Calorific Value(Kcal/m3)	8006
Gross Calorific Value (KCAL/M^3)	8886

Table 4-38: GKS091NFA-1 – Gas composition, Object-V

Object-V 1659.5-1662.5, 1666.5-1669m	
Gas Composition	Volume percentage
Methane	90.77
Ethane	1.11
Propane	0.37
i-Butane	0.09
n-Butane	0.09
i-Pentane	0.03
n-Pentane	0.03
Hexanes	0.22
Nitrogen	6.96
Carbon dioxide	0.33
He (in ppm)	BDL
H2S (in ppm)	BDL
Mol. Wt.	17.49
Sp.gravity	0.6049
Net Calorific Value(Kcal/m3)	7766
Gross Calorific Value (KCAL/M^3)	8617

Table 4-39: GKS091NFA-1 – Gas composition, Object-VI

Object-VI 1570-1576m	
Gas Composition	Volume percentage
Methane	92.92
Ethane	1.36
Propane	0.42
i-Butane	0.10
n-Butane	0.10
i-Pentane	0.03
n-Pentane	2.29
Hexanes	0.42
Nitrogen	1.88
Carbon dioxide	0.48
He (in ppm)	BDL
H2S (in ppm)	BDL
Mol. Wt.	18.39
Sp.gravity	0.6364
Net Calorific Value(Kcal/m3)	8826
Gross Calorific Value (KCAL/M^3)	9769

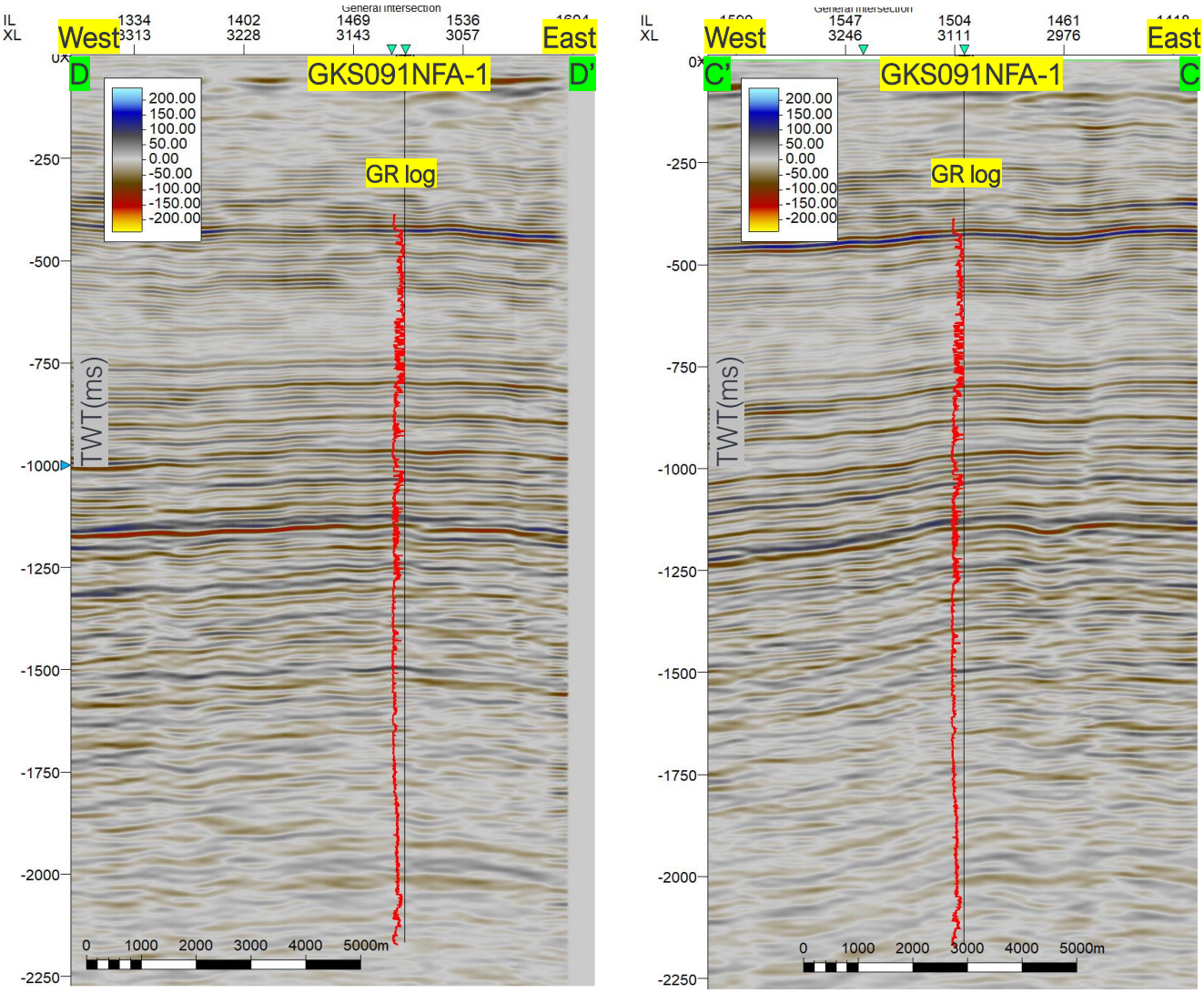
4.3.5 Geology and Reservoir Description of GKS091NFA-1

The geology of the area has been comprehensively reviewed using correlations, sections and maps. The well correlation, seismic sections, top structure, seismic attribute/amplitude and net sand/pay maps have been used to illustrate the magnitude and distribution of key reservoir properties in and around the discovered oil/gas pools (accumulations). The local tectonic setting and geological section of the area, wherever available, are also given. These maps/sections are sequentially shown field-wise and reservoir unit-wise through figures, appropriately titled and illustrated in the following section.

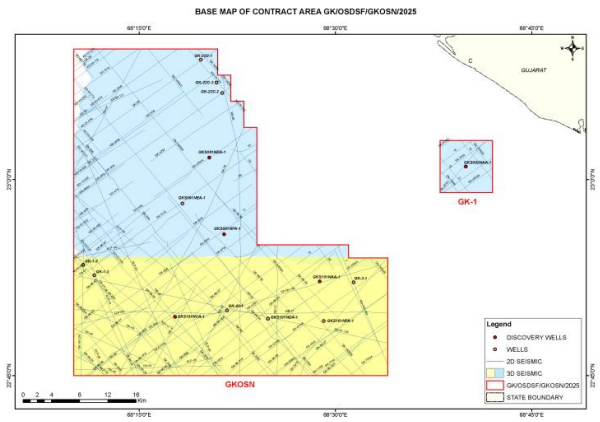
A). Geological correlations, sections and maps GKS091NFA-1

The well GKS091NFA-1 is located updip of the discovery well GKS091NDA-1 and falls on the South-Eastern part of the fault closure (refer to Figure 4-42 - Figure 4-44 and Figure 4-46 - Figure 4-50) hosting the discovery well which produced gas @1,943,60 m3/day from Early Eocene. Based on the re-processed 3D seismic volume (processed specially for sub-basaltic imaging, refer to Figure 4-40), the location is at 1.6Km to west away from the eastern bounding fault and on the optimal structural position of Early Cretaceous sequences (refer to Figure 4-41, Figure 4-45).

Figure 4-40: Seismic cross-sections passing through well GKS091NFA-1



Vertical exaggeration: 7.5x
Seismic volume: 00003.GK-OSN-2009_1_2_FINAL_PSTM_STACK_



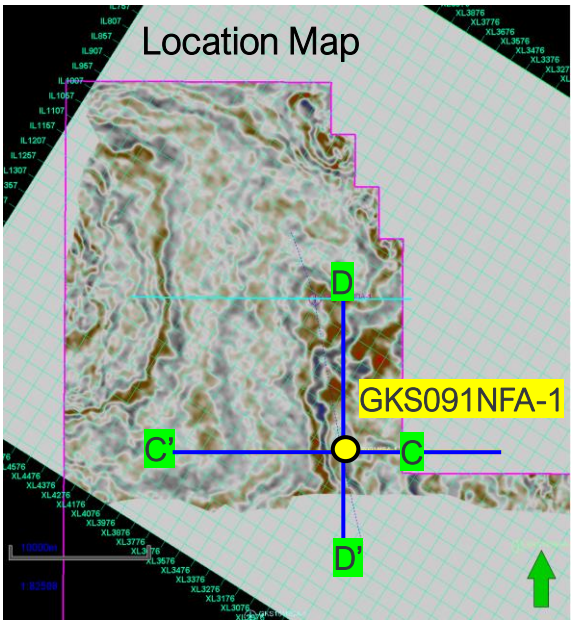


Figure 4-41: Log correlation of discovery well with nearby wells

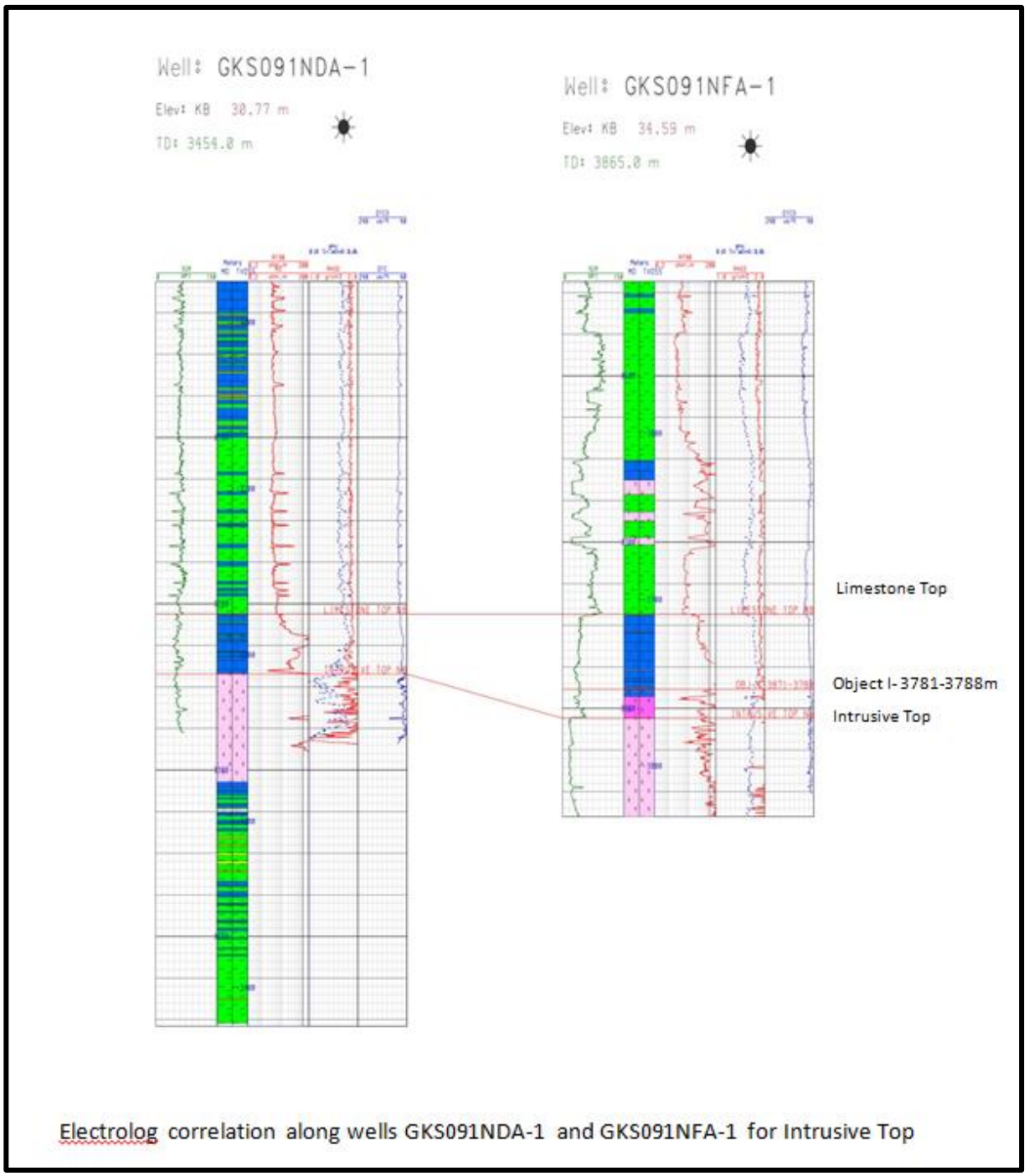
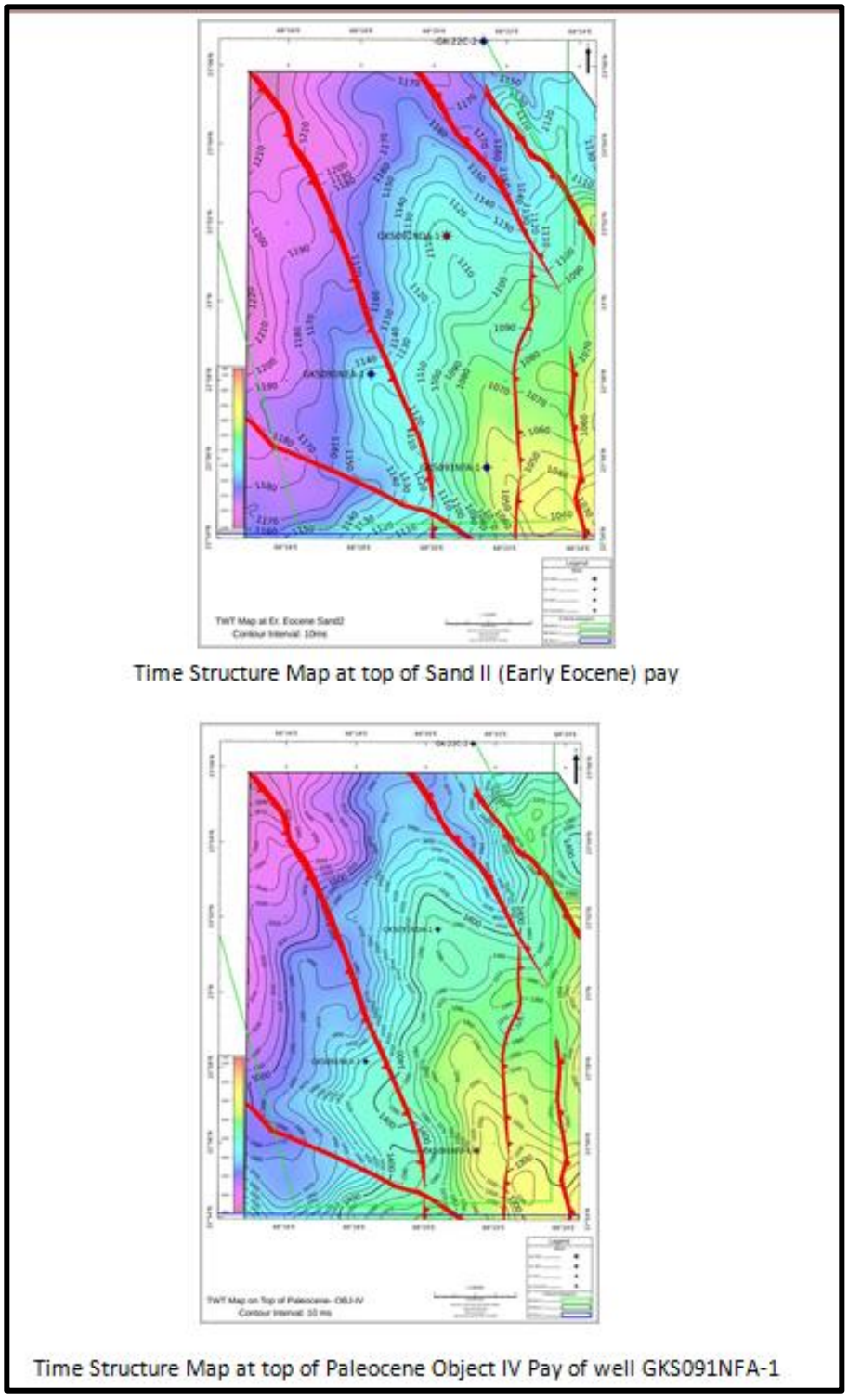


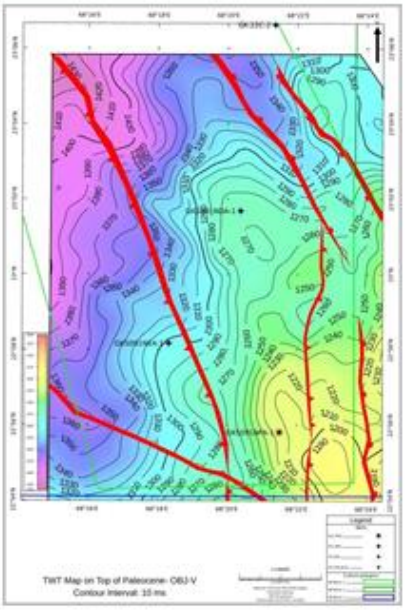
Figure 4-42: Time structure maps of Sand-II and Object-IV



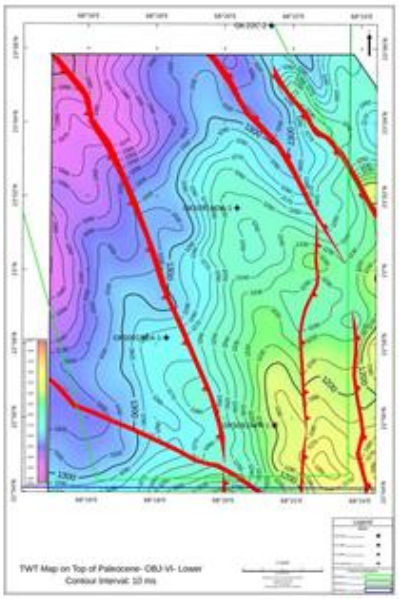
Time Structure Map at top of Sand II (Early Eocene) pay

Time Structure Map at top of Paleocene Object IV Pay of well GKS091NFA-1

Figure 4-43: Time structure maps of Object-V and Object-VI

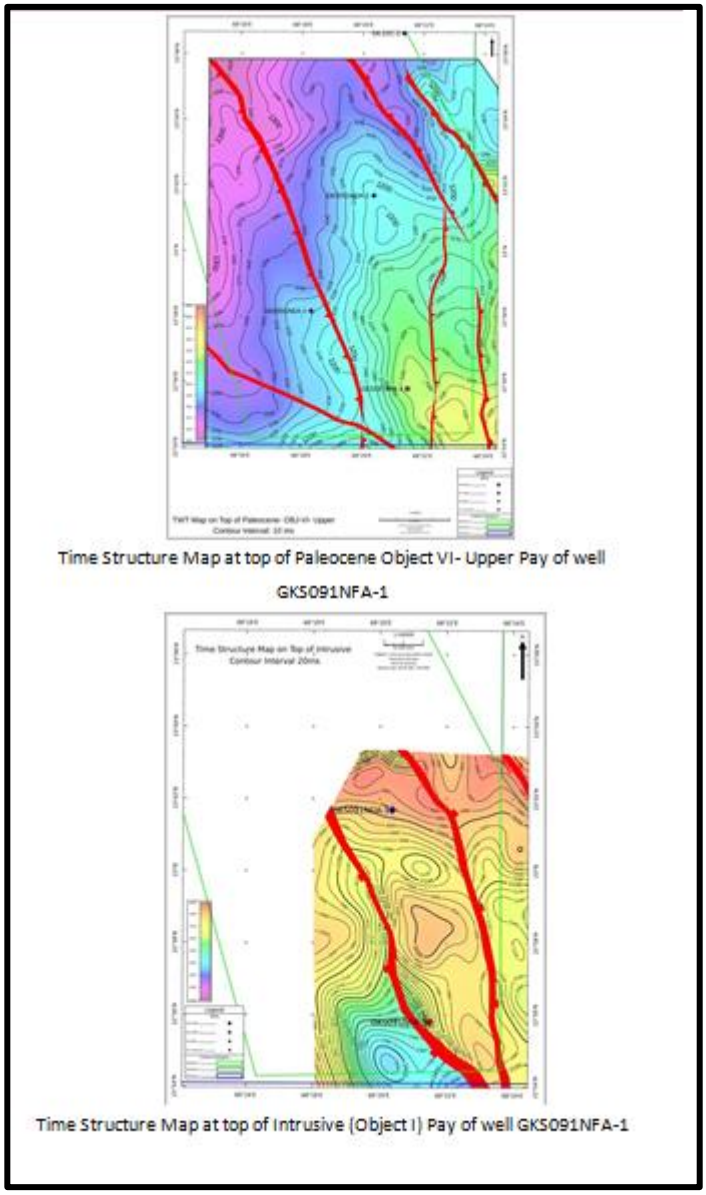


Time Structure Map at top of Paleocene Object V Pay of well GKS091NFA-1



Time Structure Map at top of Paleocene Object VI- Lower Pay of well GKS091NFA-1

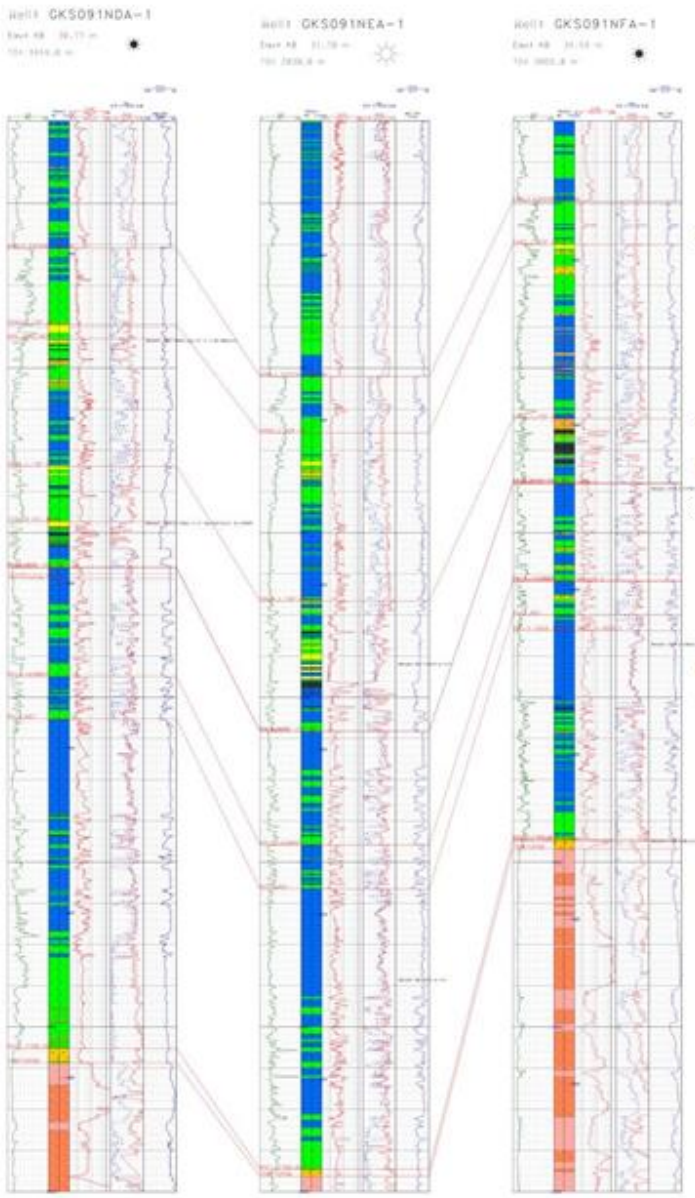
Figure 4-44: Time structure maps Object-VI and Object-I



Time Structure Map at top of Paleocene Object VI- Upper Pay of well GK5091NFA-1

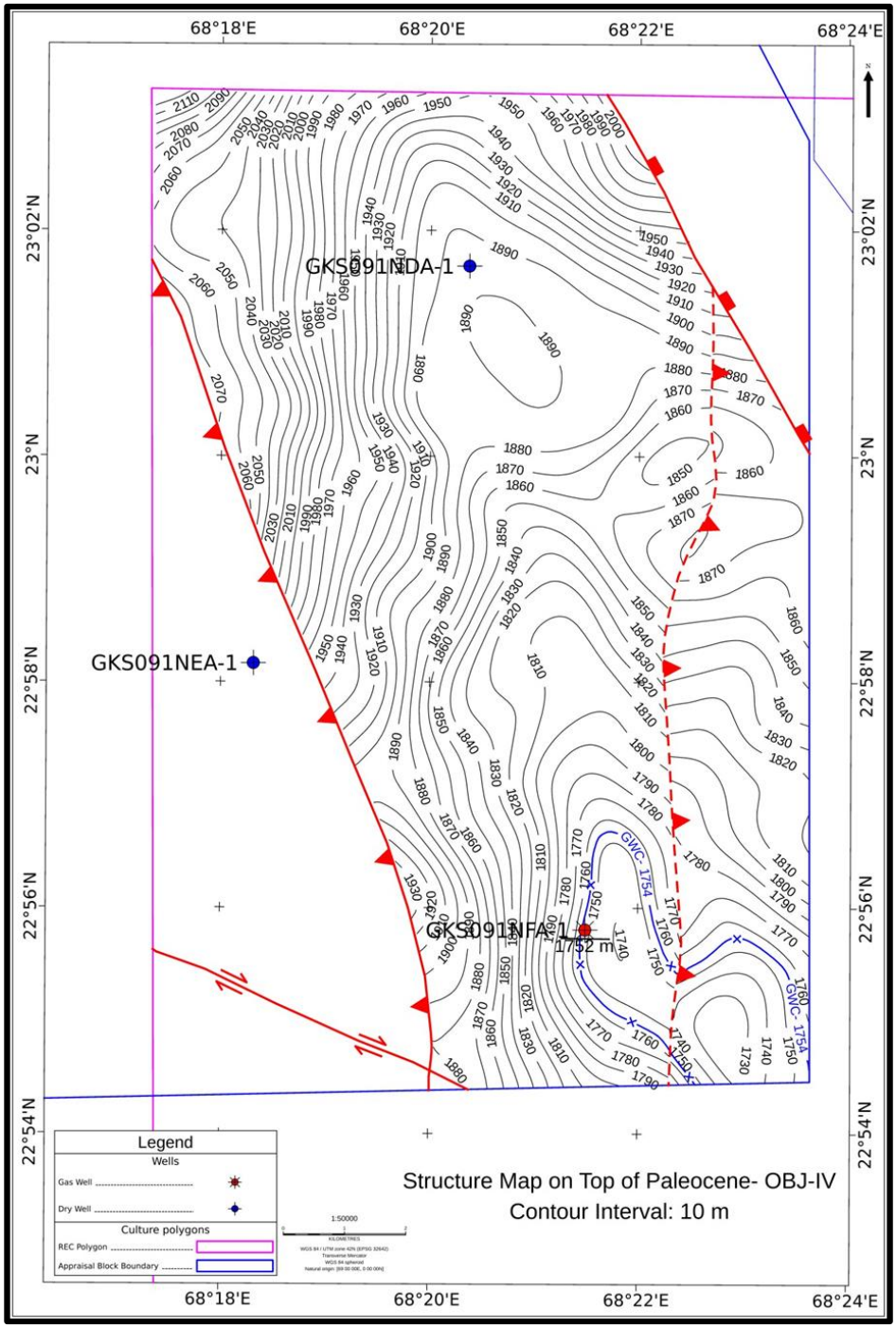
Time Structure Map at top of Intrusive (Object I) Pay of well GK5091NFA-1

Figure 4-45: Log correlation GKS5091NDA-1 GKS5091NEA-1 and GSK5091NFA-1



Electro log correlation along wells GKS091NDA-1, GKS091NEA-1 and GKS091NFA-1 for Early Eocene, Sand II and Sand I Tops

Figure 4-46: Structure & Iso pay map on top of Paleocene Object IV Pay of well GKS091NFA-1



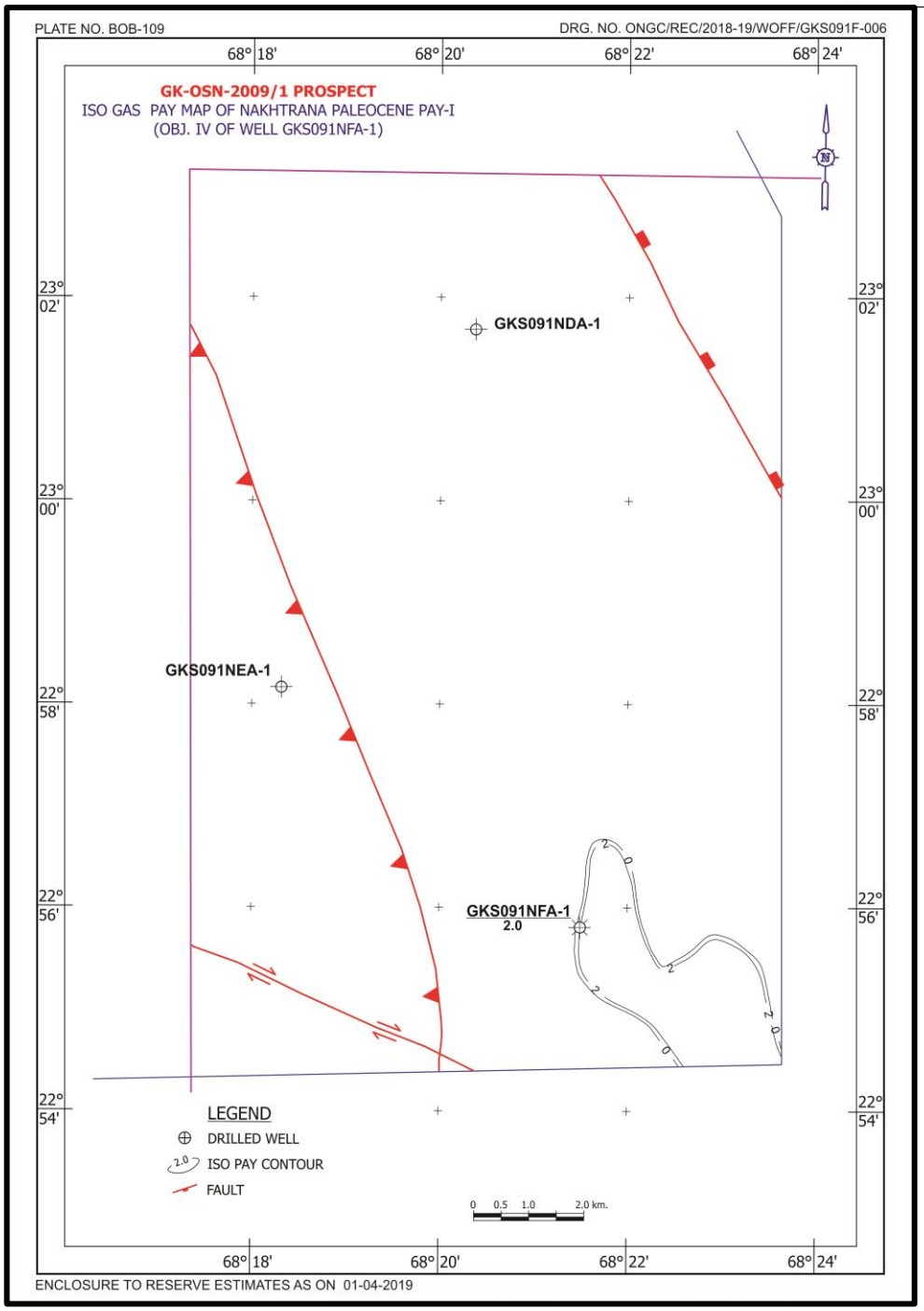
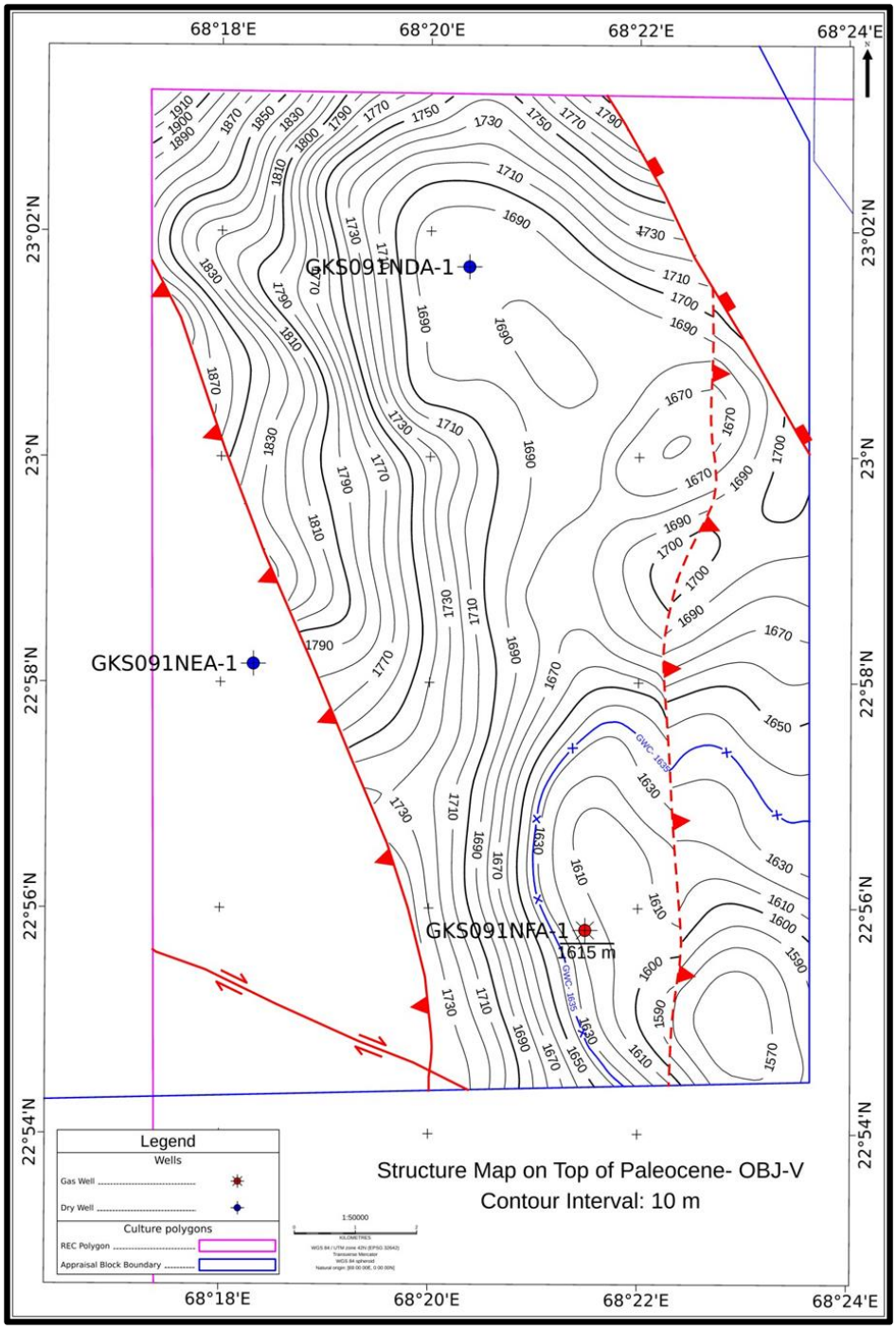


PLATE NO. BOB-109
DRG. NO. ONGC/REC/2018-19/WOFF/GKS091F-006
GK-OSN-2009/1 PROSPECT
ISO GAS PAY MAP OF NAKHTRANA PALEOCENE PAY-I
(OBJ. IV OF WELL GKS091NFA-1)
68° 18'
68° 20'
68° 22'
68° 24'
23° 02'
23° 00'
22° 58'
22° 56'
22° 54'
GKS091NDA-1
GKS091NEA-1
GKS091NFA-1
2.0
LEGEND
DRILLED WELL
ISO PAY CONTOUR
FAULT
0 0.5 1.0 2.0 km.
ENCLOSURE TO RESERVE ESTIMATES AS ON 01-04-2019

Figure 4-47: Structure map & Iso pay on top of Paleocene Object V Pay of well GKS091NFA-1



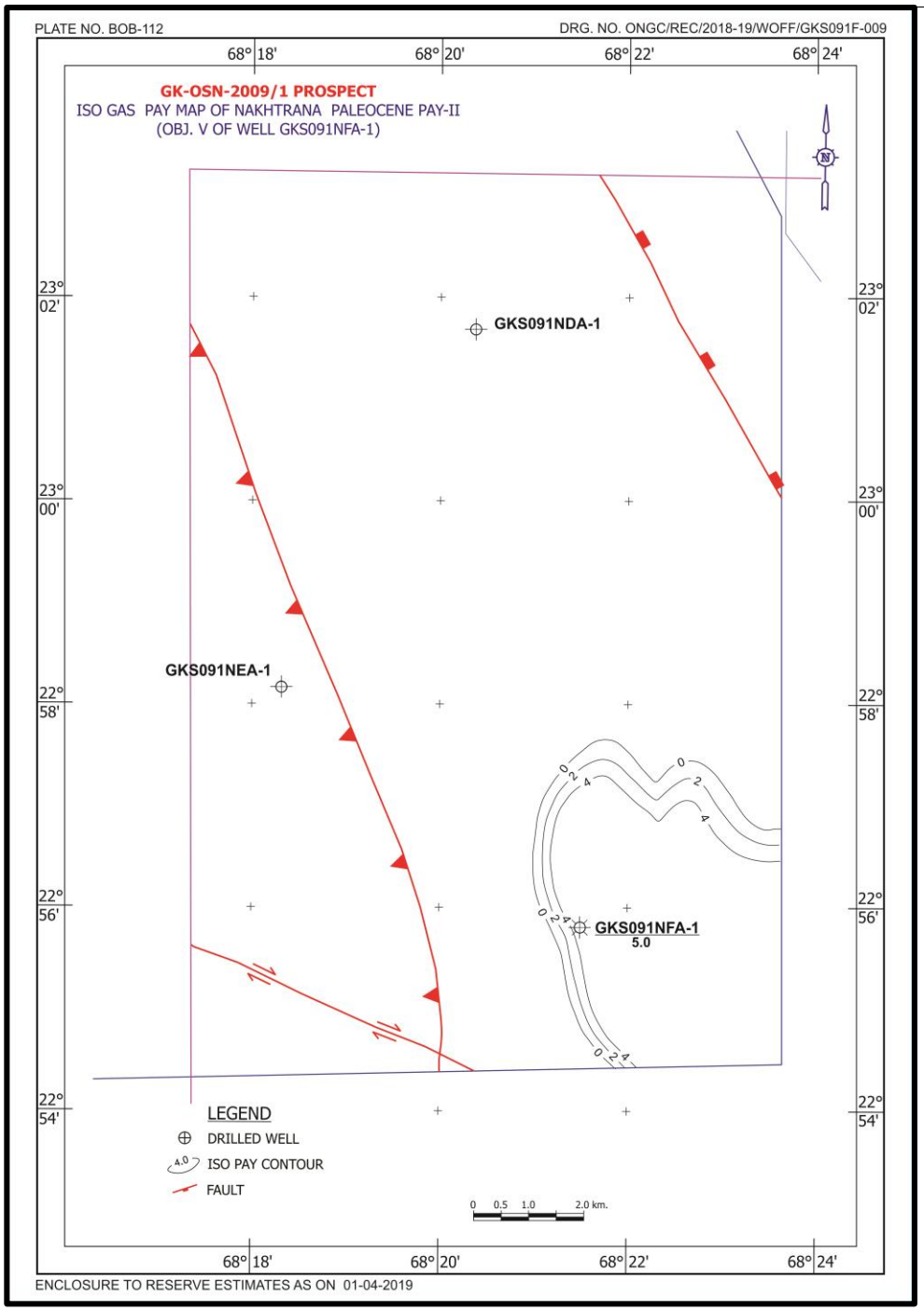
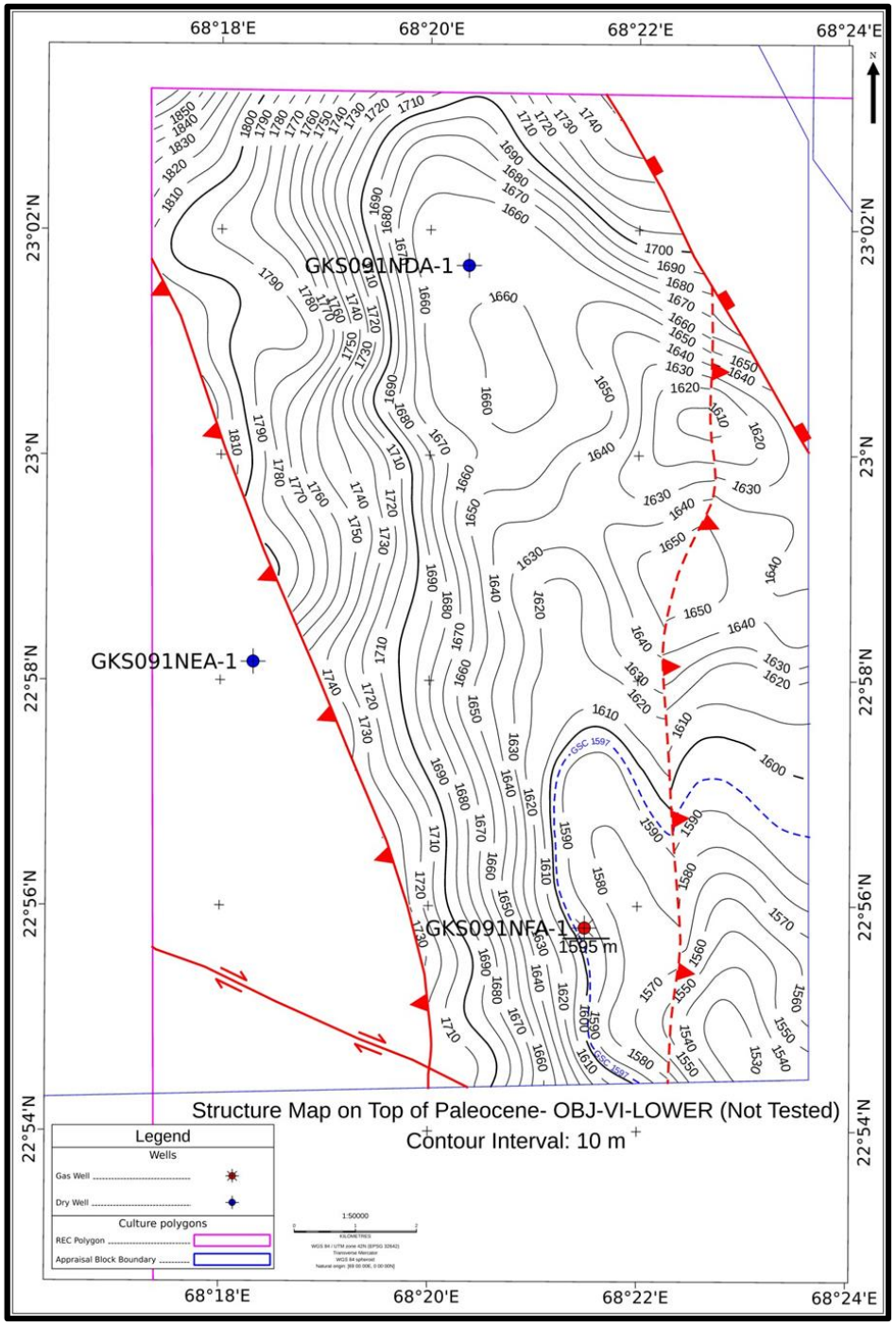


PLATE NO. BOB-112
DRG. NO. ONGC/REC/2018-19/WOFF/GKS091F-009
GK-OSN-2009/1 PROSPECT
ISO GAS PAY MAP OF NAKHTRANA PALEOCENE PAY-II
(OBJ. V OF WELL GKS091NFA-1)
68° 18'
68° 20'
68° 22'
68° 24'
23° 02'
23° 00'
22° 58'
22° 56'
22° 54'
GKS091NDA-1
GKS091NEA-1
GKS091NFA-1
5.0
LEGEND
DRILLED WELL
ISO PAY CONTOUR
FAULT
0 0.5 1.0 2.0 km.
ENCLOSURE TO RESERVE ESTIMATES AS ON 01-04-2019

Figure 4-48: Structure & Iso pay map on top of Paleocene Object VI (Lower) Pay of well GKS091NFA-1



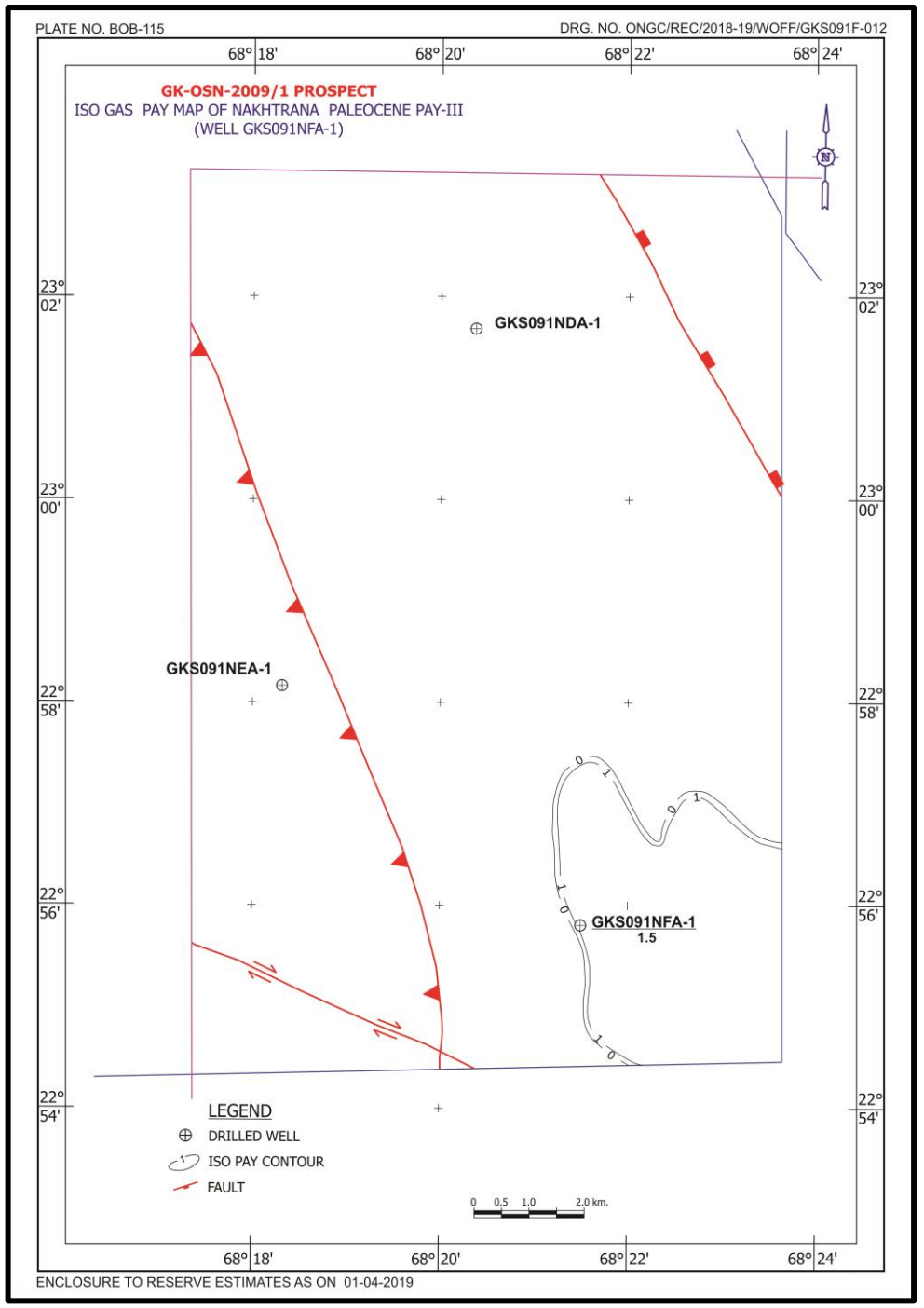
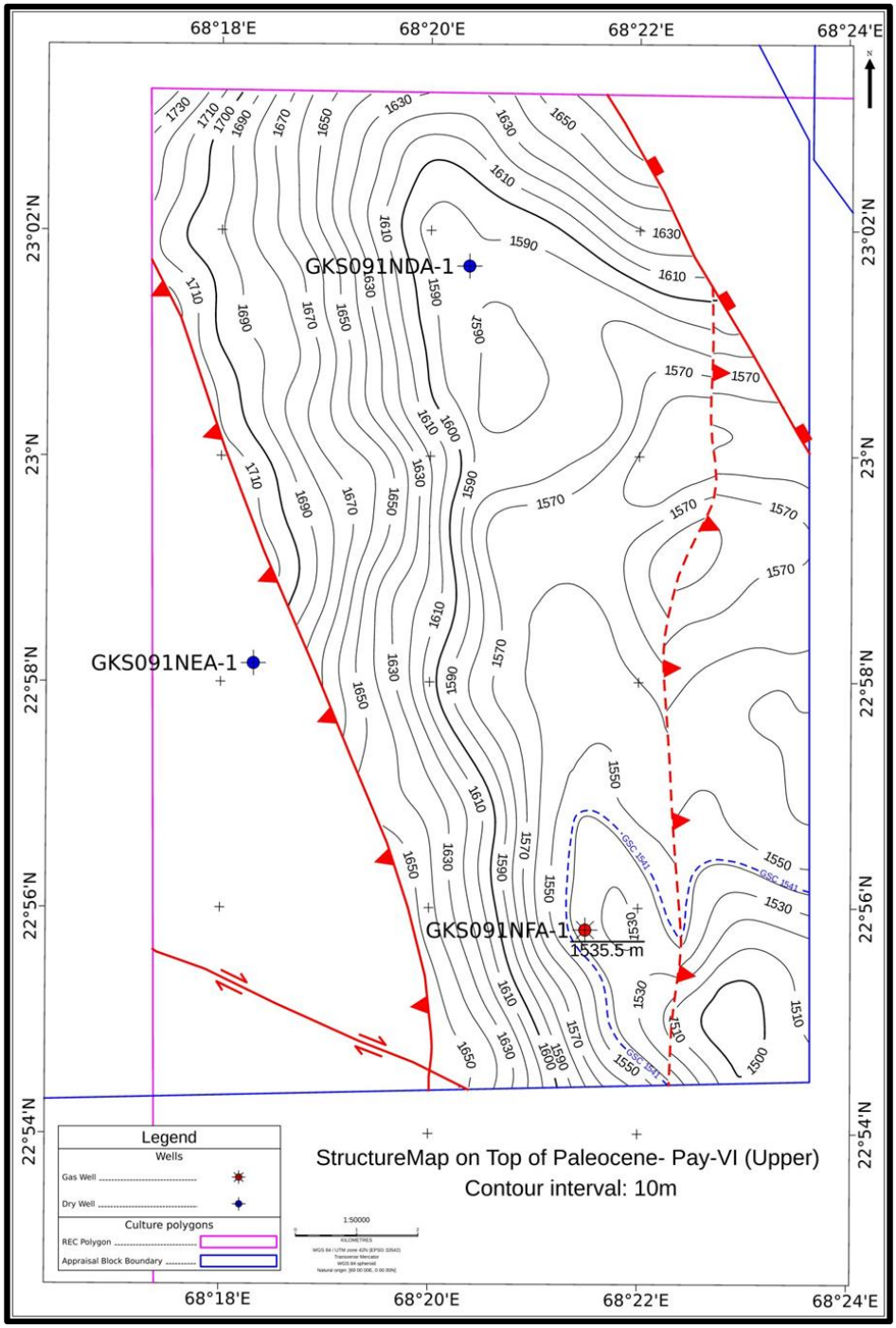


PLATE NO. BOB-115
DRG. NO. ONGC/REC/2018-19/WOFF/GKS091F-012
GK-OSN-2009/1 PROSPECT
ISO GAS PAY MAP OF NAKHTRANA PALEOCENE PAY-III
(WELL GKS091NFA-1)
68° 18'
68° 20'
68° 22'
68° 24'
23° 02'
23° 00'
22° 58'
22° 56'
22° 54'
GKS091NDA-1
GKS091NEA-1
GKS091NFA-1
1.5
LEGEND
DRILLED WELL
ISO PAY CONTOUR
FAULT
0 0.5 1.0 2.0 km.
ENCLOSURE TO RESERVE ESTIMATES AS ON 01-04-2019

Figure 4-49: Structure and Iso pay map on top of Paleocene Object VI (Upper) Pay of well GKS091NFA-1



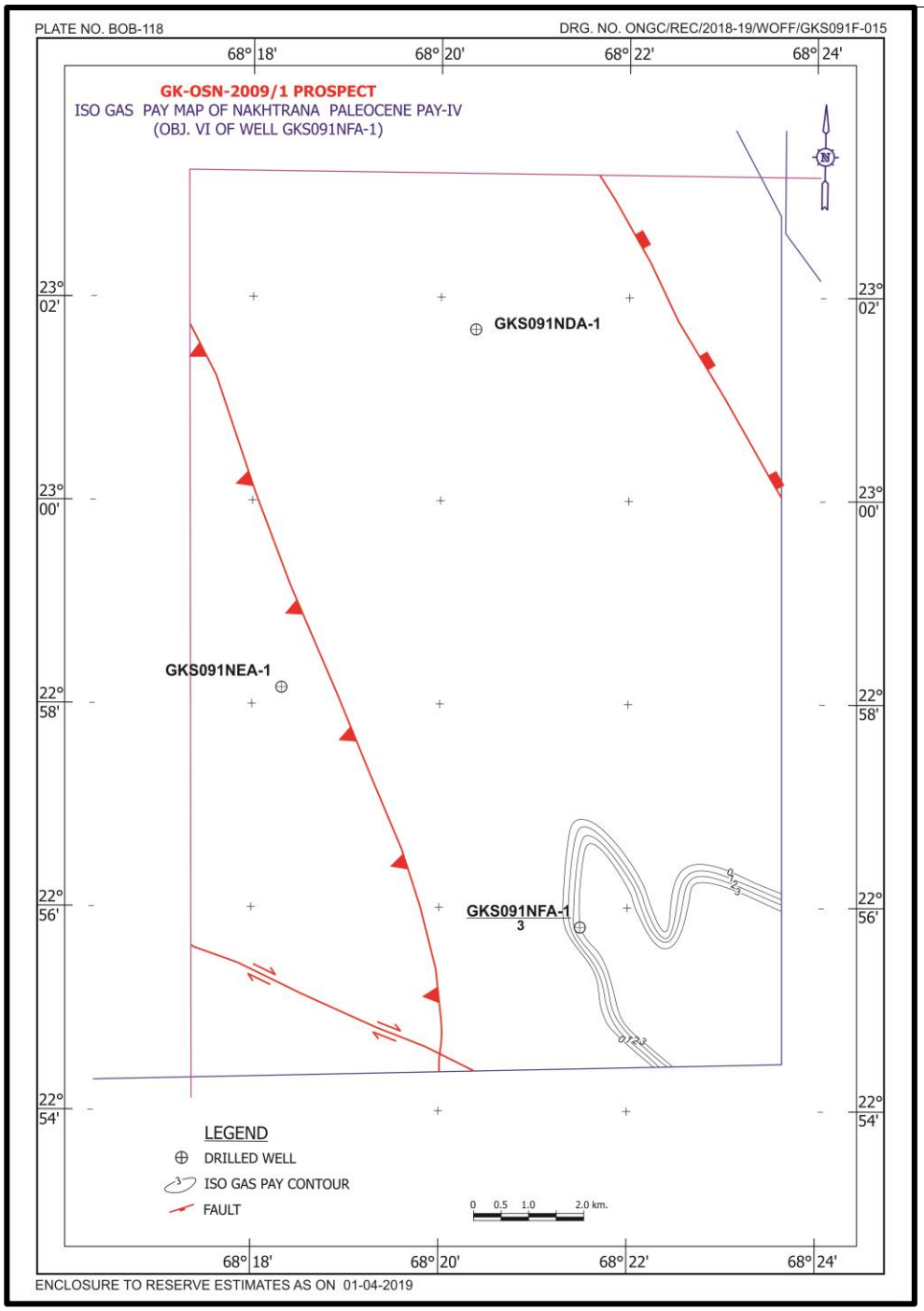
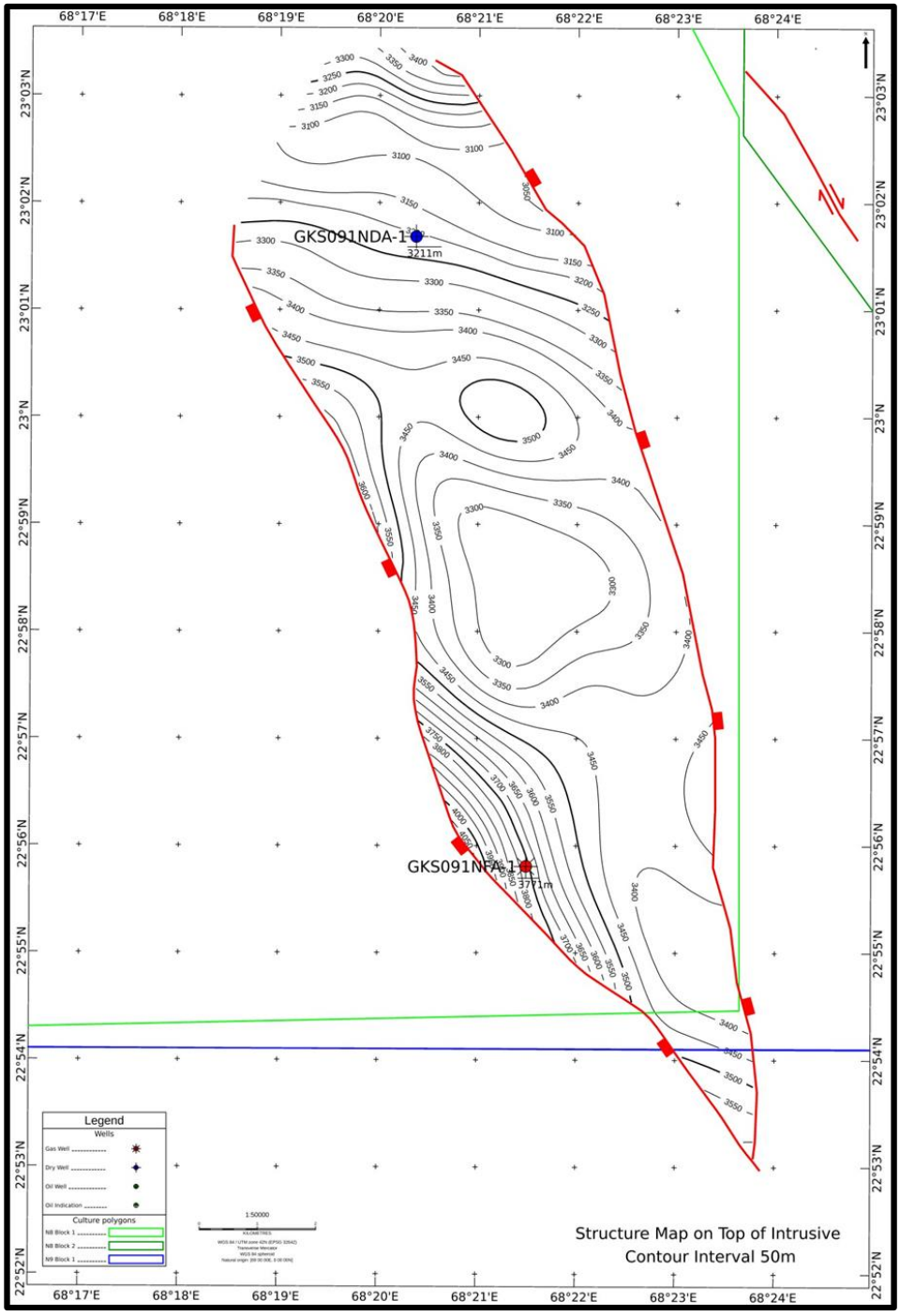
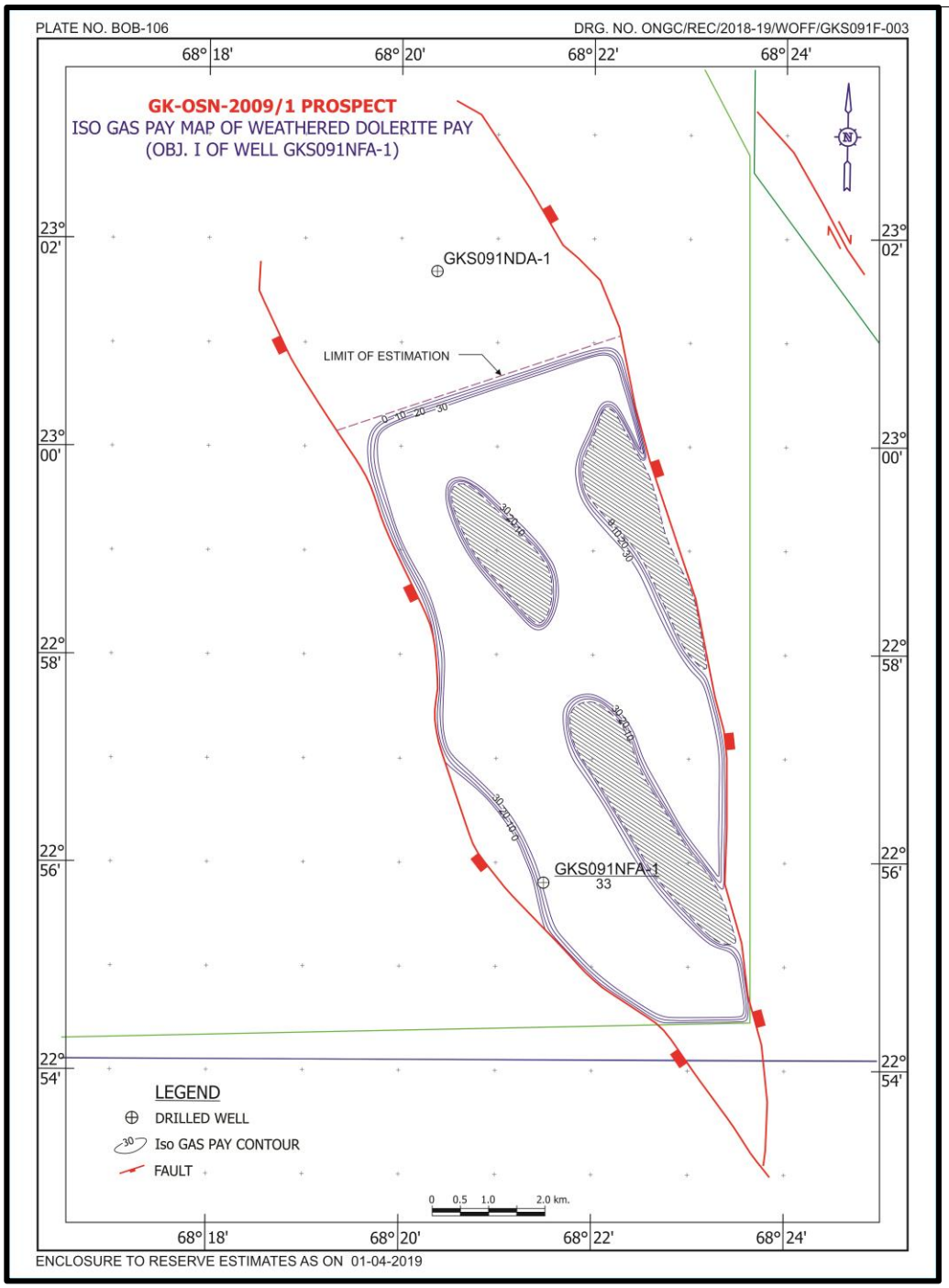


PLATE NO. BOB-118
DRG. NO. ONGC/REC/2018-19/WOFF/GKS091F-015
GK-OSN-2009/1 PROSPECT
ISO GAS PAY MAP OF NAKHTRANA PALEOCENE PAY-IV
(OBJ. VI OF WELL GKS091NFA-1)
68° 18'
68° 20'
68° 22'
68° 24'
23° 02'
23° 00'
22° 58'
22° 56'
22° 54'
GKS091NDA-1
GKS091NEA-1
GKS091NFA-1
3
LEGEND
DRILLED WELL
ISO GAS PAY CONTOUR
FAULT
0 0.5 1.0 2.0 km.
ENCLOSURE TO RESERVE ESTIMATES AS ON 01-04-2019

Figure 4-50: Structure and Iso pay map on top Intrusive (Object I, GKS091NFA-1) Pay





4.3.6 Reservoir parameters and hydrocarbon estimates (GKS091NFA-1)

The estimates of hydrocarbon in-place have been worked out under various field assumptions. All inputs, working and results, as available are presented in the following section.

Petrophysical parameters and wellbore estimates:

Earlier operator has submitted the Declaration of Commerciality (DoC) for the Block GK-OSN-2009/1 for the discoveries GKS091NDA-1 & GKS091NFA-1. Parameters used for Estimation of GIIP for different reservoir units is as below

1. **Paleocene, Nakhtarana Siltstone, Object IV (1786-1788.5m) Pay, well GKS091NFA-1**

Parameters used for in-place volume estimation are

- Φ- 26%, He 2m, Sg-50%
- GWC at 1789m as reference datum.
- Total area of 7.889 SKM
- Gas Formation Volume Factor (Bg) of 0.0079
- GIIP- **0.26 BCM**

2. **Paleocene, Nakhtarana Limestone Object V (1669-1666.5, 1662.5-1659. 5m) Pay, GKS091NFA-1-**

- Φ- 20%, He 5m, Sg-45%
- GWC at 1670m as reference datum.
- Total area of 21.658 SKM
- The Gas Formation Volume Factor (Bg) of 0.0079
- GIIP- **1.234 BCM**

2. **Paleocene, Nakhtarana Limestone Object VI-Lower (1631.5-1629.5m) Pay, well GKS091NFA-1-**

- Φ- 22%, He 1.5m, Sg-30% with
- GSC at 1632m has been considered.
- Total area is 18.282 SKM.
- Gas Formation Volume Factor (Bg) of 0.0079
- GIIP-**0.23 BCM**

3. **Paleocene, Nakhtarana Limestone Object VI-Upper (1576-1570.5m) Pay, well GKS091NFA-1-**

- Φ- 22%, He 3m, Sg-30%
- GSC at 1576m
- Total area of 12.547 SKM.
- Gas Formation Volume Factor (Bg) of 0.0079
- GIIP-**0.315 BCM**

4. **Cretaceous, Intrusive, Object I (3871-3788m) Pay, well GKS091NFA-1**

- Φ- 2%, He 33m and Sg-99%
- Total area of 39.827 SKM

- Gas Formation Volume Factor (Bg) of 0.00313 .
- GIIP-**8.314 BCM**

Table 4-40: GKS091NFA-1 – GIIP summary

Well	Pay	Object	GIIP (BCM)
GKS091 NFA-1	Intrusive	I	8.314
	Paleocene	IV	0.26
	Paleocene	V	1.234
	Paleocene	VI (Lower)	0.23
	Paleocene	VI (Upper)	0.315
Total			**10.351**

Erstwhile Operator-reported estimates on record:

The GKS091NFA-1 has a reported total gas estimate of **8.605 MMTOE**:

- Intrusive (Obj-I) 6.790 **MMTOE**
- Paleocene (Obj-IV) 0.240 **MMTOE**
- Paleocene (Obj-V) 1.049 **MMTOE**
- Paleocene (Obj-VI Upper) 0.252 **MMTOE**
- Paleocene (Obj-VI Lower) 0.274 **MMTOE**

All these hydrocarbon estimates (Table 4-40) are subject to future assessments based on Operator's own technical insights and additional information/data, which may warrant possible revision of the currently reported estimates.

4.3.7 Production Facility for Oil & Gas Evacuation

Production facilities for Oil & Gas Evacuation are summarized in Table 4-41.

Table 4-41: GKS091NFA-1 Production facility for Oil & Gas Evacuation

Sl No	Discovery Name	Basin	Water Depth (mtr)	Oil/Gas	Initial Testing details Gas Rate	Pay sand	Depth of discovered reservoir (TVDSS)	Near-by surface Facility with distance
1	GK-1 (GKS092NAA-1)	Kutch Shallow Offshore	3.5	Gas	Qg=115168 m3/d through ½" choke		898-902 mtr	Upcoming SunPetro Dwarka Onshore Terminal (GK-28) : 120 KM.Cairn Suvali Plant: 489 KM
2	GKOSN-2009/1-D (GKS091NDA-1)	Kutch Shallow Offshore	18	Gas	1,80,000 m3/d	Jakhau (Jakhau & Early Eocene)	1450m	No Facility exists in the region. Planned for evacuation to Dwarka
3	GKS091NFA-1 (GKS091NFA-1)	Kutch Shallow Offshore	19	Gas	2,36,524 m3/d	Weathered Dolerite (Naliya & Mid Cretaceous)	3770m	No Facility exists in the region (Planned for evacuation to Dwarka)
4	GK-OSN-2010-1-A(GKS101NAA-1)	Kutch Shallow Offshore	16	Gas	45,873 m3/d through 1/2" choke, FTHP 250psi	Jakhau (Jakhau & Early Eocene)	1260m	No Facility exists in the region (Planned for evacuation to Dwarka)
5	GK-OSN-2010-1-C (GKS101NCA-1)	Kutch Shallow Offshore	32	Gas	1,63,000 m3/d	Chhasra FM (Chhasra & Mid Miocene)	880m	No Facility exists in the region (Planned for evacuation to Dwarka)
6	GSOSN-2004/1-A (GSS041NAA-1)	Kutch Shallow Offshore	99	Gas	35,597 m3/d (3/8")	Jhuran & Late Jurassic	4370m	Dwarka-115 KM
7	GSS041NAA-B (GSS041NAA-2)	Kutch Shallow Offshore	92	Gas	1,56,563 m3/d	Bhuj & Early Cretaceous	4370m	Dwarka-115 KM

4.3.8 Status of Additional Wells in the area (Polygon)

In GKOSN polygon, there are 14 wells drilled (GK-1-1, GK-1-2, GK-22C-1, GK-22C-2, GK-22C-3, GK-3-1, GK-40-1, GKS091NDA-1, GKS091NEA-1, GKS091NFA-1,GKS101NAA-1, GKS101NCA-1, GKS101NDA-1, GKS101NFA-1) of which GKS091NDA-1, GKS091NFA-1, GKS101NAA-1, GKS101NCA-1 are discovery wells. Additionally, GK-22C-1 also produced gas during initial testing. Data of all the wells other than discovery are given at 4 .8

4.3.9 Main reports available for discovery well GKS091NFA-1

- Well Completion Report (WCR), June 2019
- Formation Evaluation report (FER), November 2020
- Reservoir Study Report (included in WCR)
- Sedimentological report, July 2021 & August 2018

GK/OSDSF/GKOSN/2025 GKS101NAA-1 FIELD

4.4 DESCRIPTION OF KUTCH OFFSHORE GKS101NAA-1 (NELP Block GK-OSN-2010/1)

Discovery Well GKS101NAA-1 was drilled in the NELP Block GK-OSN-2010/1 with an objective to explore the hydrocarbon potential of Eocene formation (Primary), Miocene & Paleocene formations (Secondary) with a target depth of 1550m and the well was drilled upto 1734m. The well had penetrated through Kandla, Chhasra, Godhra, Narayan Sarovar, Tuna, Fulra, Jakhau, Nakhatrana and it was terminated after drilling 193m in Deccan Trap formation.

The discovery of the block GK-OSN-2010/1 is situated between blocks GK-OSN-2009/1 & GK-OSN-2009/2 in the north, GK-28 PML area in the east and GS-OSN-2004/1. The water depth in the well is 16.7m.

Discovery well GKS101NAA-1 is located south of discoveries GKS091NDA-1 & GKS091NFA-1 in the NELP Block GK-OSN-2009/1 which have produced gas at different levels. Another well GK-22C-1, which is situated further north of GKS091NDA-1 (GK-OSN-2009/1) also flowed gas @ 2,80,850 m3/day from Early Cretaceous Bhuj Sandstone (2840-2845m). Other nearby hydrocarbon producing wells are in GK-28 & 42 area which are located South East of discoveries of the block GK-OSN-2010/1 also have gas discoveries from Tertiary Formations (Middle Miocene, Early Eocene and Paleocene). The cluster GK-28 & 42 is currently under development.

These two discoveries (GKS101NAA-1 & GKS101NCA-1) are part of this GKOSN Polygon under the current DSF-IV offer (Block-GK/OSDSF/GKOSN/2025).

4.4.1 Drilling and Well completion

In the cluster GKOSN, there are four discoveries GKS091NDA-1, GKS091NFA-1, GKS101NAA-1 & GKS101NCA-1 and there are 10 additional wells drilled in this polygon of the contract area. Key information of the GKS101NAA-1 has been collated and presented hereunder. This includes the Well Construction Diagram (Figure 4-51) and the Litho-column Information (Figure 4-52).

4.4.1.1 Drilling and well completion

Key information of drilled wells have been collated and presented hereunder. The adjoining figures wherever shown illustrate the Well Construction Diagram and the Litho-column Information for key wells. Other well statics like kelly bush reference depth, water depth, drilled and logged depth including well coordinates are made available in Sections through various cross-references.

Figure 4-51: Well profile of GKS101NAA-1

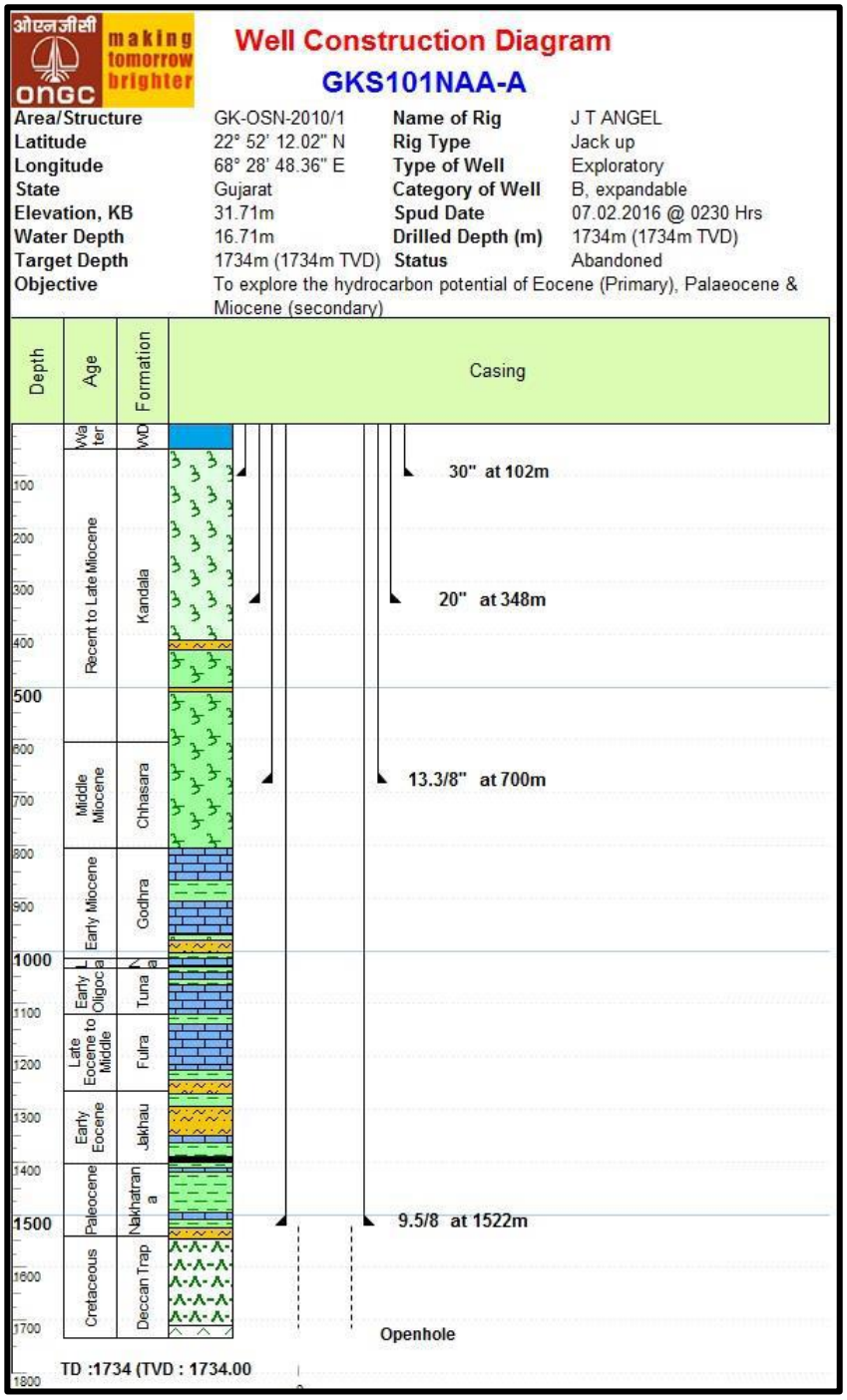
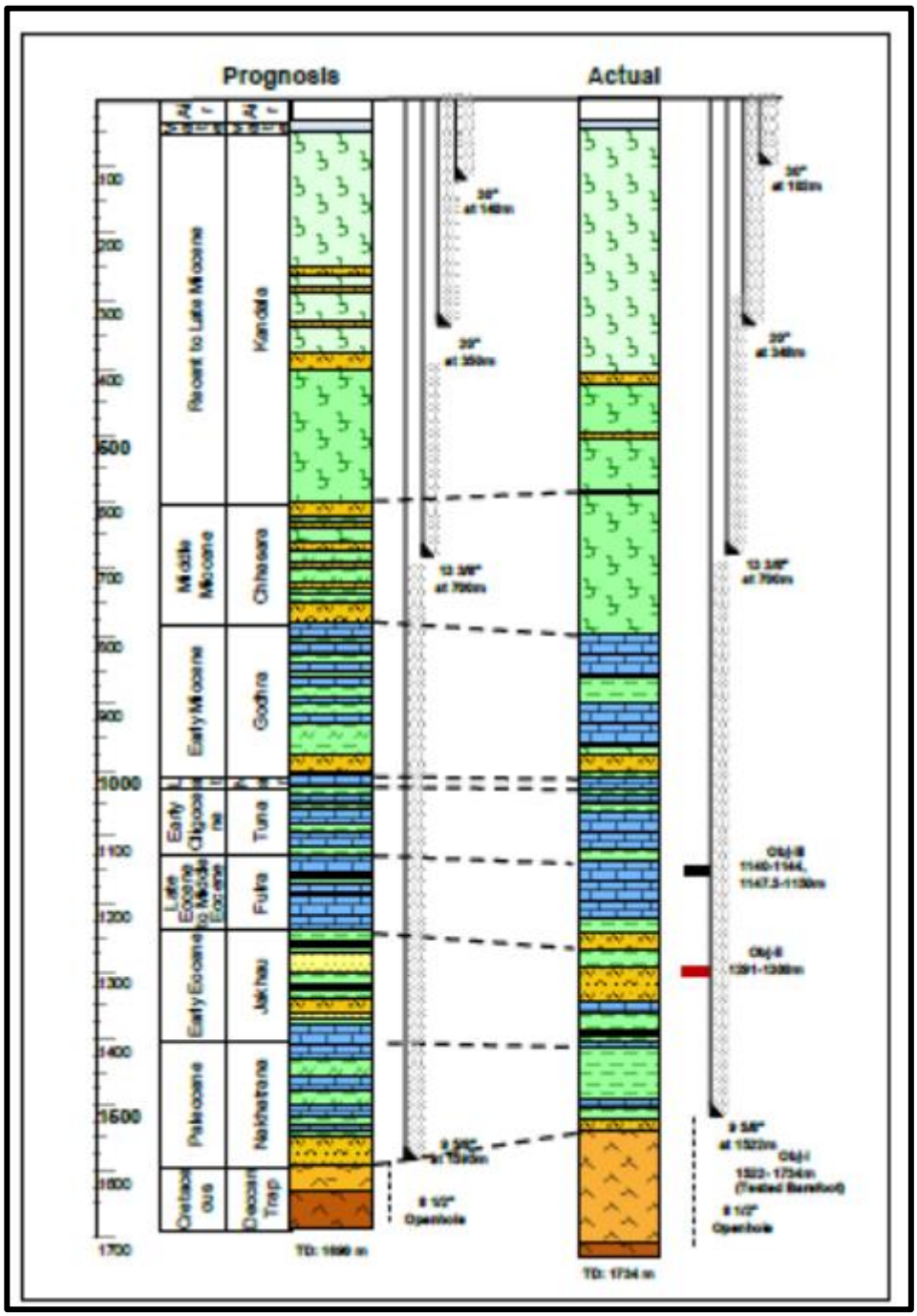


Figure 4-52: Litho-section information of GKS101NAA-1



4.4.2 Well logging and formation evaluation

The well logs of discovery well GKS101NAA-1 along with some key wells in the contract area have been reviewed. The logs recorded in various open-hole sections along with cased-hole logs and information of conventional and other wireline formation test data are presented in this docket.

The availability of key input reports like Well Completion Reports (WCR), Formation Evaluation Report (FER) and Declaration of Discovery for the Block GK-OSN-2010/1 have been checked and relevant information has been taken. Reservoir parameters of interesting zones and results of the tested zone(s) have been included in this report. Log motifs of tested/ interesting zone of key wells are also appended (refer to Figure 4-53).

A) Well completion and log evaluation reports availability (GKS091NFA-1)

WCR/ FER availability	Spud date	KB	Drilled depth/Water Depth
Only WCR available	07.02.2016	31.7 m	1734m/16.71m

B) Well logs acquired (GKS101NAA-1)

Logs recorded in the well GKS101NAA-1 are as given below :

Sl. No	Hole Size (“)	Date	Interval (m)		Data Recorded	Service Provider/ Remarks
			From	To		
1	17 ½”	12.02.16	694.5	348	PEX-HRLA-HNGS-SS-SP	Schlumberger Wireline Max recorded BHT: 115°F
2		12.02.16	694.5	348	SONIC SCANNER	
1	12 ¼”	18.02.16	1553	700	PEX-HRLA-HNGS- SP	Schlumberger Wireline Max recorded BHT: 161°F
2		18.02.2016	1550	700	FMI-SONIC SCANNER	Schlumberger Wireline BHT: 169°F
3		19.02.2016	1541	775	ECS-GR	-
4			1518	660	CMR-GR	-
5		21.02.2016-22.02.2016	1510	648	MDT	MDT pretests were carried out at 85 depth points including samples
6		23.02.2016	1544	37	VSP	VSP was carried out at 5m interval

7		28.02.2016	1479	700	CBL-VDL	Schlumberger Wireline Max recorded BHT: 157°F, Recorded in '0' and '700' psi pass

Sl. No	Hole Size "	Date	Interval (m)		Data Recorded	Service Provider/ Remarks
			From	To		
1	8 ½"	3.03.2016	1729	1520	PEX-HRLA-HNGS-SP	Schlumberger Wireline Max recorded BHT:170°F
2		3.03.2016	-	-	FMI-SS	Logs were not recoded as the Tools got held up in 8 ½" section at 1627m.
3		04.03.2016	-	-	FMI-SS	Tools got held up in 8 ½" section at 1627m.
4		04.03.2016	1627	1520	FMI-SS	**Repeat attempt. Logs were recoded from held up depth ie. 1627m**
Note: ECS, CMR, SWC & VSP logs, though planned, were not attempted due to repeated tool held ups at 1627m in 8 ½" section as well as Drill String held ups during round trip.						

C). Well log evaluation and initial test results (GKS101NAA-1)

In the discovery wells GKS101NAA-1 and GKS101NCA-1in the block GK-OSN-2010/1, full set of logging data was acquired. On the basis of the log processing, and the geological information during drilling, reservoir characteristics, Jakhau Formation in well GKS101NAA-1 was interpreted to be hydrocarbon bearing and produced gas on testing.

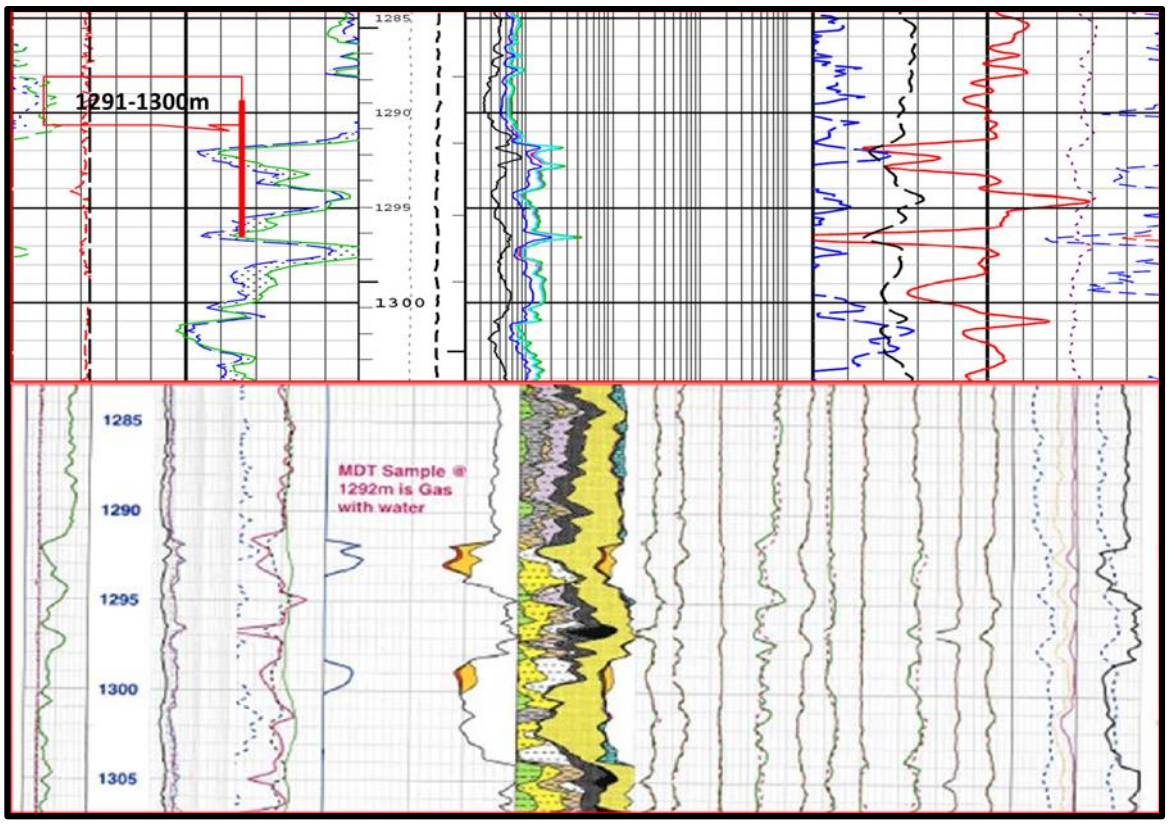
Object	Interval	Saturation	Porosity	Resistivity	Effective Pay Thickness (He)
		%	%	ohm.m	m
Object II	1291-1300m	40	25-30	2-10	3

Summary of testing results in the well GKS101NAA-1 is presented in Table 4-42.

Table 4-42: GKS101NAA-1 test results, Object-I, II and III

Sr. No	Well No	Obj. No	Interval (Pay zone)	Testing Results
1	GKS101NAA-1	I	1522-1734 (Deccan Trap)	Well flowed diesel & feeble gas at 2 to 5 psi.
		II	1291-1300m (Jakhau/Siltstone)	Flowed gas at rate of 45873 m3/d (through ½" choke), FTHP : 250psi, FTHT : 80°F
		III	1140-1144, 1147.5-1150m (Fulra Limestone)	Well flowed diesel & Brine Salinity (ppm as NaCl) 59400 Salinity of mud filtrate during drilling: 64000ppm as NaCl

Figure 4-53: Well log motif, Composite log and ELAN of well GKS101NAA-1 (Object-II)



4.4.3 Well testing and workover history

In the well GKS101NAA-1, based on log characteristics and hydrocarbon show detected during drilling, three objects were identified for production testing. Object-I was tested barefoot in Paleocene siltstone and weathered basalt. Object –II was tested in Early Eocene Sandstone and Object-III was tested in Fulra Limestone. Object-II produced gas.

Object-I (1522-1734m), Deccan Trap/Basalt, Barefoot

The well did not flow any fluid and was devoid of hydrocarbons.

Object-II (1291-1300), Jakhau

The well was tested through TCP-DST and main results are presented in Table 4-43.

Table 4-43: GKS091NDA-1 TCP-DST well testing results for Object-II

Object No & interval	Bean Size (")	Q_{gas} (m3/day)	FTHP (PSI)	FTHT (˚F)	STHP (PSI)	Remarks
II 1291-1300m	½	-	225	78	-	
					1690	Surface buildup 6hrs
	1/8	14248	1450	68	-	
	1/4	32317	800	68-70	-	
	3/8	38882	400	75	-	
	½	45873	250	80	-	
						Closed for PCTV buildup

Object-III (1140-1144m, 1147.5-1150m), Fulra, Middle to Late Eocene,

Well flowed diesel & Brine with Salinity as 59400 ppm as NaCl. Salinity of mud filtrate during drilling was 64000ppm as NaCl. The well did not produce any hydrocarbons.

4.4.4 Reservoir engineering studies and analysis

Key reservoir engineering datasets, wherever available have been collated and presented under various data genres. In a comprehensive data presentation, the results are included from well tests, formation dynamics tests (Table 4-44), reservoir pressure build-up study and PVT data/ results.

4.4.4.1 Formation dynamics tests (GKS101NAA-1) - 12.25" Phase

Table 4-44: GKS101NAA-1 formation dynamic tests 12.25" Phase

Test No.	MD (m)	Mud Hyd. Pressure (psi)		Formation ressure (psi)	Last BUP (psi)	Temp (°F)	Drawdown Mobility (md/cp)	Test code	Remarks
		Before	After						
1	1522.5	2896.39	2896.00	-	-	134	-	T	-
2	1523.0	2897.13	2896.83	-	-	155.6	-	L	Tried pumping, No success
3	1524.3	2899.68	2899.21	-	-	156	-	L	Tried pumping, No success
4	1525.7	2902.06	2901.91	-	-	157	-	T	Sluggish build up after pump stopped
5	1494.4	2842.34	2842.76	-	-	157.6	-	L	Tried pumping, No success
6	1495.7	2845.32	2845.11	-	-	158.89	-	L	Tried pumping, No success
7	1495.0	2843.96	2843.87	-	-	160.61	-	L	Tried pumping, No success
8	1486.0	2826.87	2826.91	-	-	160.29	-	L	Tried pumping, No success
9	1485.2	2825.37	2825.52	-	-	160.56	-	L	Tried pumping, No success
10	1485.6	2825.88	2826.08	-	-	161.49	-	L	Tried pumping, No success
11	1460.3	2777.90	2778.29	-	-	161.73	-	T	Tried pumping, ild up. Dry test.
12	1460.0	2777.09	2777.53	-	-	160.9	-	T	-
13	1459.6	2776.29	2776.70	-	-	160.27	-	T	-
14	1454.5	2766.67	2767.06	-	-	160.23	-	T	-
15	1454.3	2766.23	2766.78	-	-	160.33	-	T	-
16	1391.0	2645.89	2646.49	-	-	158.99	-	T	-
17	1390.8	2645.76	2646.71	-	-	157.12	-	T	-
18	1520.2	2890.38	2890.37	-	-	162.02	-	T	-
19	1519.8	2889.49	2889.86	-	-	163.05	-	T	-

20	1499.4	2850.96	2850.69	2194.02	2194.02	173.89	3.05	G	Pump Time - 235mins, Vol - 30.7 Ltrs,

Test No.	MD (m)	Mud Hyd. Pressure (psi)		Formation ressure (psi)	Last BUP (psi)	Temp (°F)	Drawdown Mobility (md/cp)	Test code	Remarks
		Before	After						
									Collected Sample in SC. LFA showed water with very thin streaks of gas
21	1451.5	2760.05	2760.73	-	-	171.08	-	T	-
22	1452.0	2761.41	2761.64	2122.41	2122.41	169.14	1.8	G	-
23	1458.7	2774.01	2773.80	-	-	168.58	-	L	Tried pumping, No success
24	1458.6	2773.60	2773.75	-	-	168.17	-	T	-
25	1442.4	2742.98	2743.30	-	-	168.16	-	T	-
26	1441.7	2741.73	2742.03	-	-	167.85	-	T	-
27	1416.0	2693.13	2693.29	-	-	166.38	-	T	-
28	1415.5	2692.00	2692.36	-	-	165.83	-	T	-
29	1391.0	2645.92	2646.49	-	-	164.94	-	T	-
30	1390.4	2644.90	2645.27	-	-	163.71	-	T	-
31	1393.0	2649.86	2650.19	-	-	163.59	-	T	-
32	1392.5	2648.90	2649.04	-	-	163.54	-	T	-
33	1389.5	2643.27	2643.57	-	-	163.57	-	T	-
34	1388.7	2641.66	2641.91	-	-	163.78	-	T	-
35	1292.0	2459.58	2459.97	-	-	160.9	-	T	-
36	1291.5	2458.73	2458.87	-	-	159.5	-	T	-
37	1160.5	2211.15	2211.94	-	-	154.9	-	T	-
38	1163.0	2216.35	2216.64	-	-	153.4	-	T	-
39	1164.2	2218.63	2219.09	1703.7	1703.7	152.8	0.3	G	Low Mobility
40	1292.0	2460.06	2428.14	1890.6	1890.6	158.2	4.8	G	Pump Time - 110mins, 2 samples collected MPSRs. Around 22 liters was pumped. LFA showed Gas
41	1301.5	2478.51	2478.62	-	-	161.1	-	T	-
42	1301.6	2478.58	2478.62	-	-	161.1	-	T	-
43	1301.7	2476.72	2477.66	-	-	161.5	-	T	-
44	1299.5	2473.12	2473.57	-	-	161.4	-	T	-
45	1299.6	2473.52	2473.86	-	-	161.3	-	T	-
46	1299.4	2473.16	2473.38	-	-	161.4	-	T	-
47	1312.8	2497.81	2497.92	-	-	161.1	-	T	-
48	1312.3	2496.84	2497.12	-	-	161.4	-	T	-
49	1313.1	2498.30	2498.50	-	-	161.9	-	T	-

50	1310.0	2492.54	2492.81	-	-	162.1	-	T	-
51	1309.9	2492.38	2492.61	-	-	162.4	-	T	-
52	1452.0	2759.98	1282.72	-	-	169.8	-	T	Station log stopped before retracting

Test No.	MD (m)	Mud Hyd. Pressure (psi)		Formation Pressure (psi)	Last BUP (psi)	Temp (°F)	Drawdown Mobility (md/cp)	Test code	Remarks
		Before	After						
53	1452.0	1286.49	2759.72	-	-	170.5	-	T	Continued Retract Station
54	1452.1	2759.78	2759.91	-	-	171.4	-	T	-
55	1451.9	2759.46	2758.23	2118.8	2118.8	175.7	2.0	G	Pump Time - 342 mins. Sample collected in SC. Pumped 35 liters. LFA showed water with very thin streaks of gas
56	1141.5	2171.59	1987.15	-	-	157.42	-	T	-
57	1141.3	2191.32	2191.20	-	-	155.60	-	T	-
58	1141.2	2190.85	2191.30	-	-	154.77	-	T	-
59	1141.0	2192.63	2192.88	-	-	154.11	-	T	-
60	1143.3	2196.78	2197.58	-	-	154.00	-	T	-
61	1141.3	2178.7	2178.4	-	-	134.7	-	T	-
62	1141.1	2178.24	2178.30	-	-	137.24	-	T	-
63	1143.2	2182.48	2182.23	1689.6	1689.6	137.88	0.07	G	Valid, but with low confidence
64	1143.4	2182.88	2182.75	-	-	138.94	-	T	-
65	1149.0	2193.44	2193.47	-	-	139.29	-	T	-
66	1148.8	2193.11	2193.11	-	-	139.71	-	T	-
67	1141.5	2179.19	2179.36	-	-	140.18	-	T	-
68	1141.4	2178.99	2178.95	-	-	140.41	-	T	-
69	1141.3	2178.82	2178.98	-	-	140.56	-	T	-
70	1142.0	2179.84	2180.41	-	-	140.71	-	T	-
71	1141.2	2178.68	2178.91	-	-	141.05	-	T	-
72	1143.4	2182.68	2183.14	-	-	141.24	-	T	Tried pumping, but could not sustain pumping.
73	1143.3	2182.60	2183.23	-	-	141.74	-	T	
74	1160.6	2215.66	2215.85	-	-	142.25	-	T	
75	1249.5	2383.33	2383.68	-	-	143.42	-	L	Tried Pumping, but seal could not
76	1249.2	2382.78	2383.13	-	-	144.68	-	L	
77	870.0	1665.10	1666.10	-	-	141.89	-	L	
78	870.1	1665.66	1666.09	-	-	136.86	-	L	

79	868.8	1663.12	1663.51	-	-	135.53	-	L	be established.
80	868.9	1663.43	1663.55	-	-	135.17	-	L	
81	857.8	1642.09	1642.63	-	-	134.98	-	T	Tried pumping, but could not sustain pumping.
82	849.4	1626.38	1626.72	-	-	134.63	-	L	Tried Pumping, but seal could not be established.
83	848.0	1623.71	1624.03	-	-	134.38	-	T	-
84	806.3	1544.66	1545.07	-	-	134.1	-	T	-
85	827.8	1585.83	1585.94	-	-	132.96	-	T	-
86	782.6	1585.83	1585.94	-	-	132.96	-	T	-

4.4.4.2 Pressure Transient Studies and Build up study (GKS101NAA-1)

Pressure transient studies have been carried out in three objects, out of which Object-II produced gas. Results of Pressure Build & Bean study are presented in Figure 4-54 and Figure 4-55.

Figure 4-54: GKS101NAA-1 Pressure Build-up Plot (Obj-II)

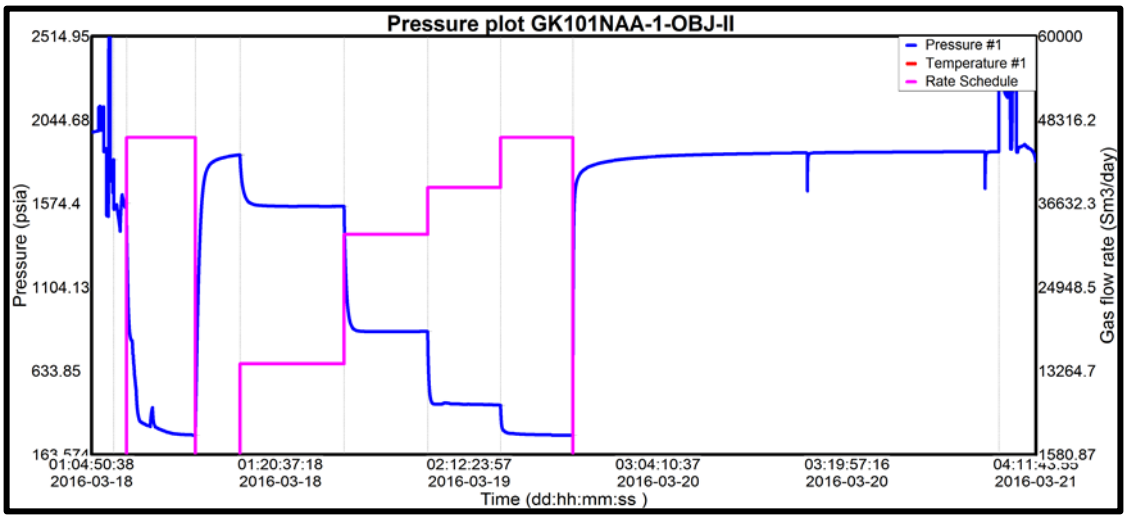
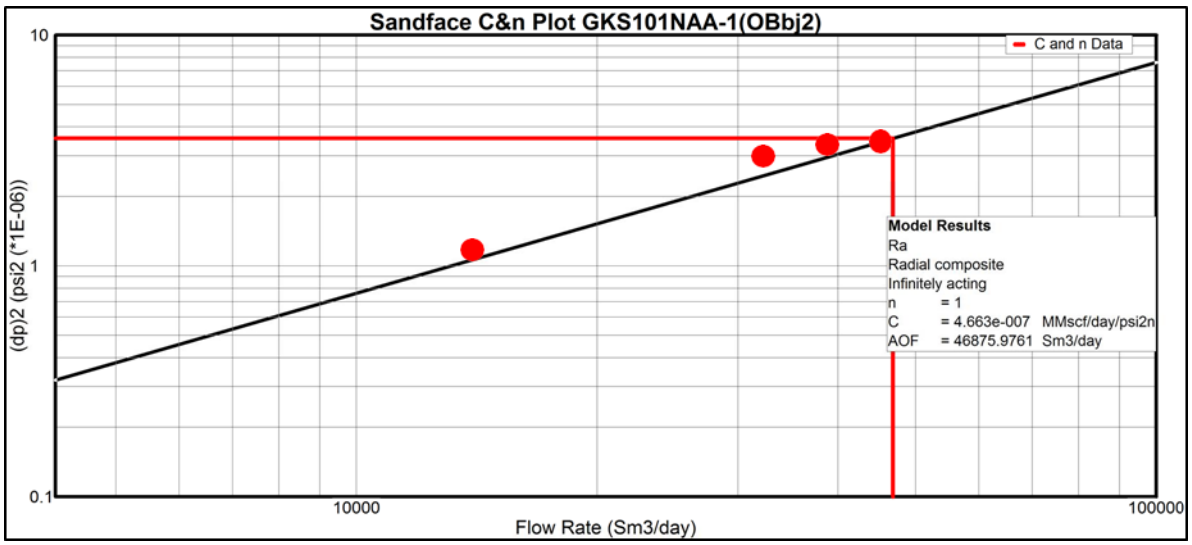


Figure 4-55: GKS101NAA-1 Sandface C&N Plot (Obj-II)



Main results of the interpretation are presented in Table 4-45.

Table 4-45: GKS101NAA-1 – Pressure Build-up interpretation parameters, Object-II

Parameter	Results
Wellbore storage(bbl/psi)	0.0082
Permeability (md)	4.83
Skin factor	6.08
Rate-Dependent Skin Coefficient (D) (1/Mscf/d)	0
Radius of investigation (ft)	523
Radial Distance to Discontinuity *(Lrad)* ft	115
Simulated reservoir pressure(psia)	1879.3
AOFP, m3/day	46875

4.4.4.3 Gas composition analysis (GKS101NAA-1)

Gas composition results of Object-II are presented in Table 4-46.

Table 4-46: GKS101NAA-1 – Gas composition, Object-II

Sl.No	Components	Vol %
1	Methane	91.17
2	Ethane	2.28
3	Propane	0.67
4	i- Butane	0.20
5	n-Butane	0.14
6	i-Pentane	0.08
7	n-Pentane	0.05
8	Hexanes	0.27
9	Carbon Dioxide	0.69
10	N2	4.45
11	He (ppm)	BDL
12	H2S (ppm)	BDL
13	Sp. Garavity	0.5772
14	Net calorific Net calorific value (Kcal/m3)	8118
15	Gross Calorific Value (Kcal/m3)	9000

4.4.5 Geology and Reservoir Description of GKS101NAA-1

The geology of the area has been comprehensively reviewed using correlations, sections and maps. The well correlation, seismic sections, top structure, seismic attribute/amplitude and net sand/pay maps have been used to illustrate the magnitude and distribution of key reservoir properties in and around the discovered oil/gas pools (accumulations). The local tectonic setting and geological section of the area, wherever available are also given. These maps/sections are sequentially shown field-wise and reservoir unit-wise through figures, appropriately titled and illustrated in the following section.

A). Geological correlations, sections and maps (GKS101NAA-1)

Well GKS101NAA-1 (refer to Figure 4-57) was proposed with an objective to explore hydrocarbon potential of Eocene Formation (Primary), Miocene & Paleocene Formations (Secondary). The location was placed on a four-way closure at Early Eocene and Early Miocene level. The Well GKS101NAA-1 falls in the northeastern corner of the Block GK-OSN-2010/1 and is located 5km west of drilled well GK-3-1. The well was initially drilled down to 1654m and in view of gas shows at the bottom, the well was further deepened and drilled down to the revised target depth of 1734 m (MSL). The well was drilled in normal pressure regime. It has penetrated the normal sequences of Kandla. Chhasra, Godhra, Narayan Sarovar, Tuna, Fulra, Jakhau, Nakhtarana, Trap, Mundra and Bhuj Formations. During drilling Gas shows were observed within Godhra, Fulra, Jakhau, Nakhtarana Formation and Weathered Basalt/Basalt formations (refer to Figure 4-56).

Three objects were tested, Object-I was tested barefoot in the Interval 1522-1734m within Paleocene siltstone and weathered basalt/basalt. It flowed feeble gas with negligible FTHP of 2-5 psi. Object-II was tested in the Interval 1291-1300m within Jakhau Formation (Sand-II) of Early Eocene and it flowed gas @ 45873m3/day through ½" choke at FTHP: 250 psi. (refer to Figure 4-58 - Figure 4-61). Object-III was tested in the Interval 1140-1144m; 1147.5-1150m within Fulra limestone of Middle-Late Eocene and no influx was observed.

Figure 4-56: WE Log correlation

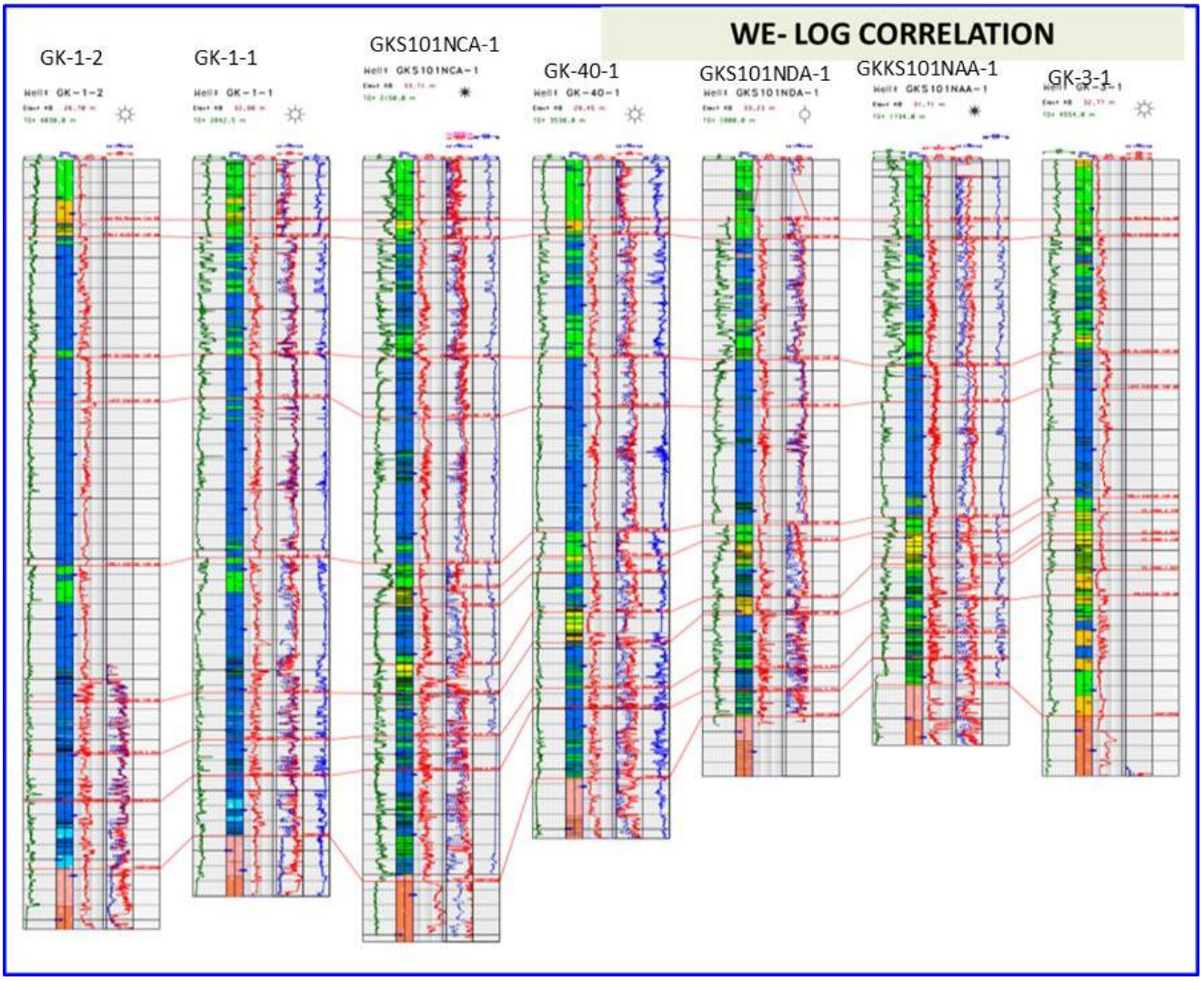
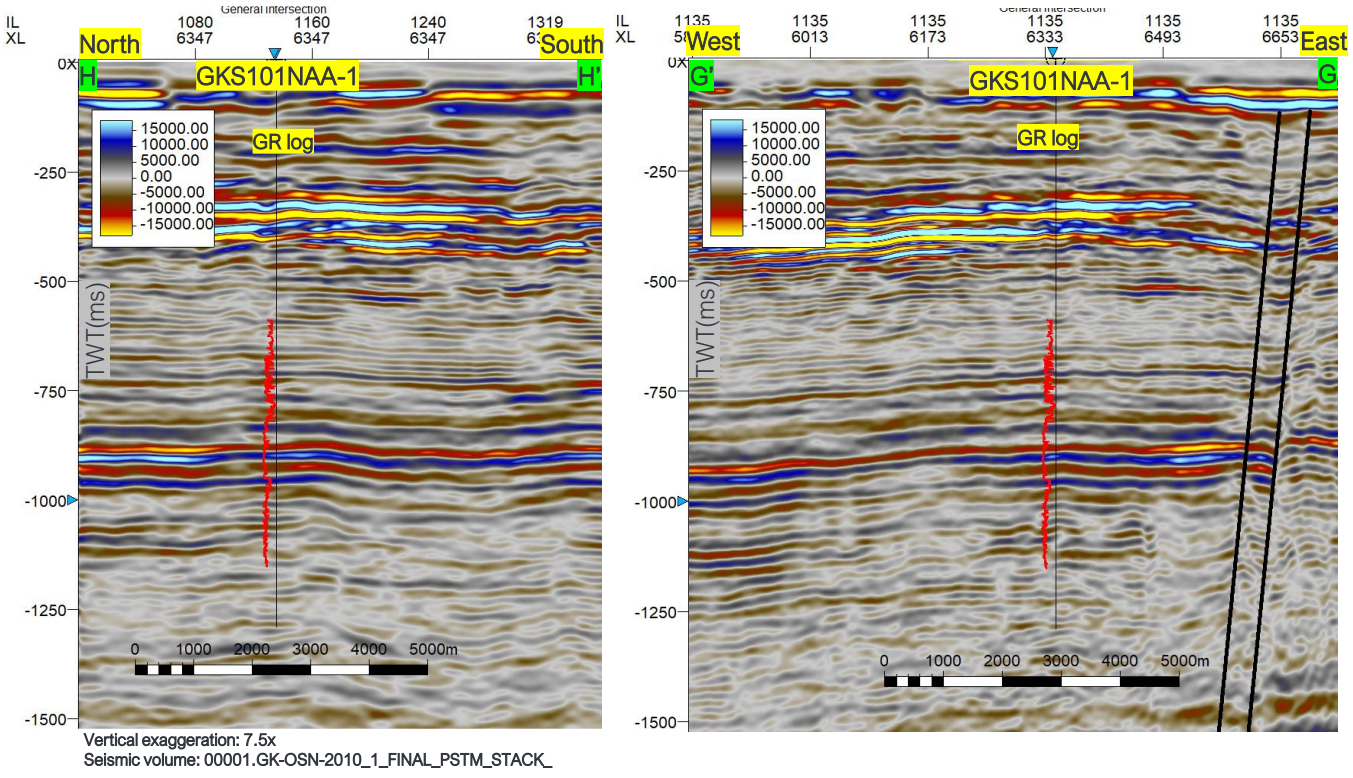
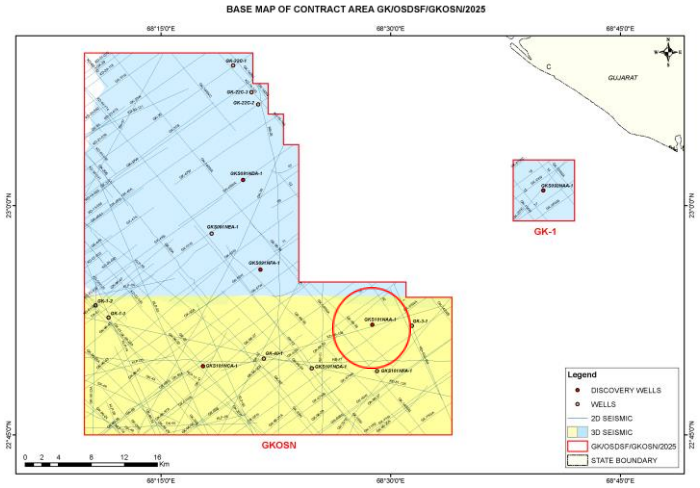


Figure 4-57: Seismic cross-section passing through well GKS101NAA-1





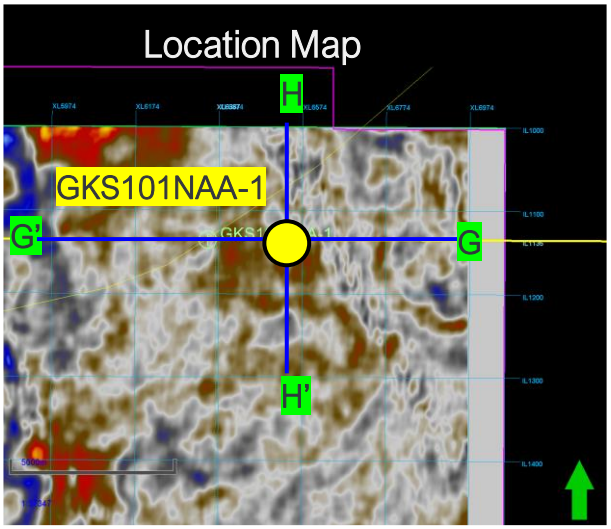


Figure 4-58: Structure map at Sand-II Top, Early Eocene

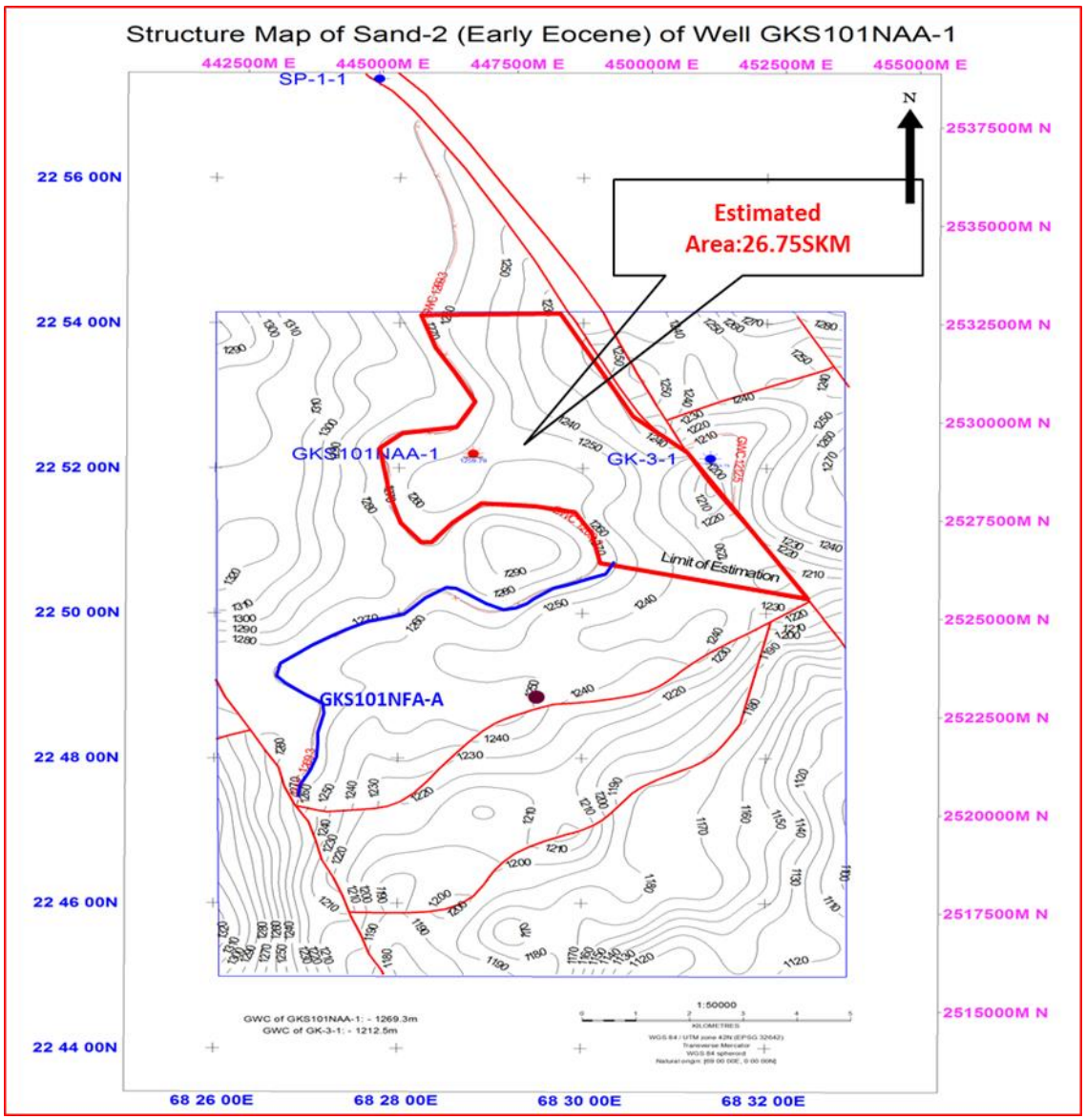


Figure 4-59: Structure map with GWC at Sand-II Top, Early Eocene

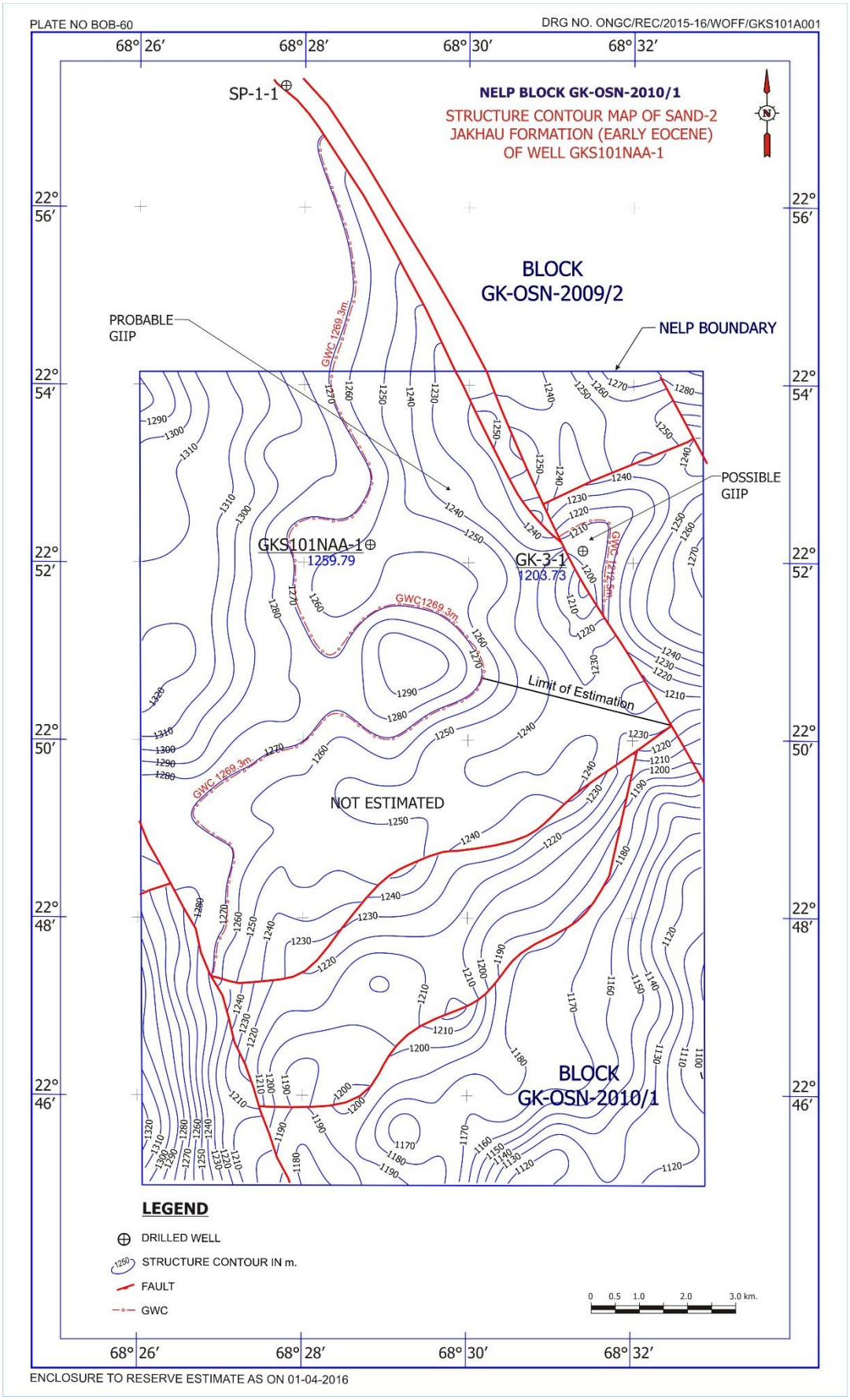


Figure 4-60: Iso pay map of Sand-II Top, Early Eocene

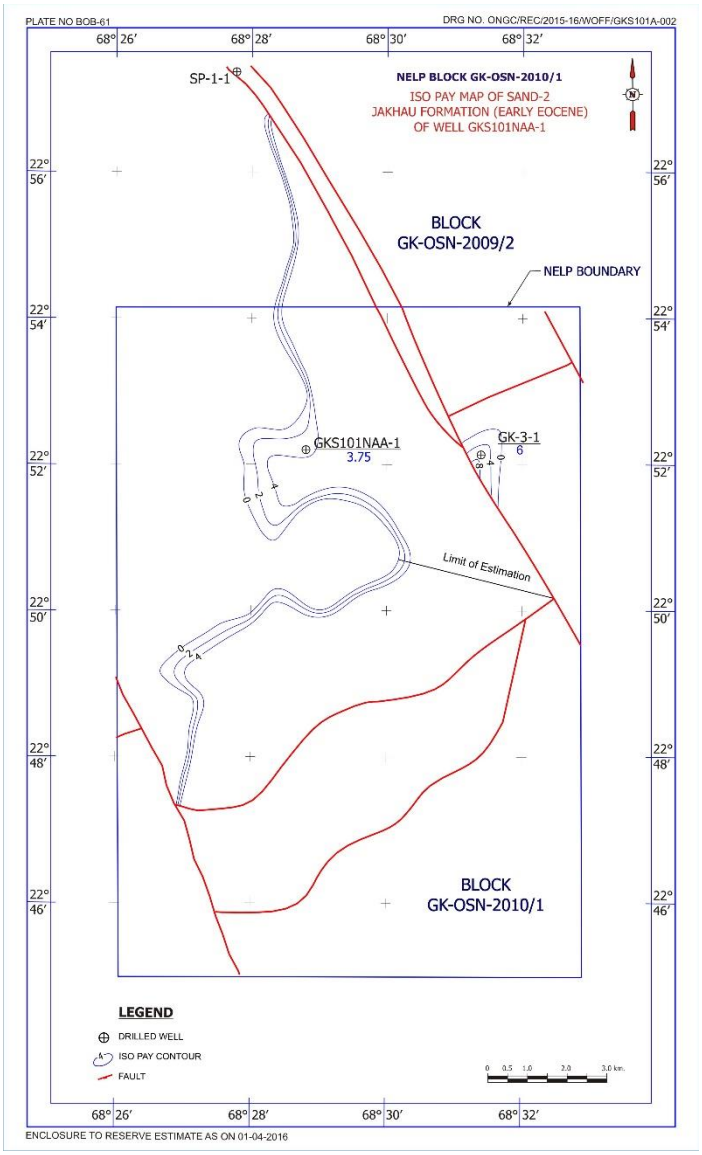
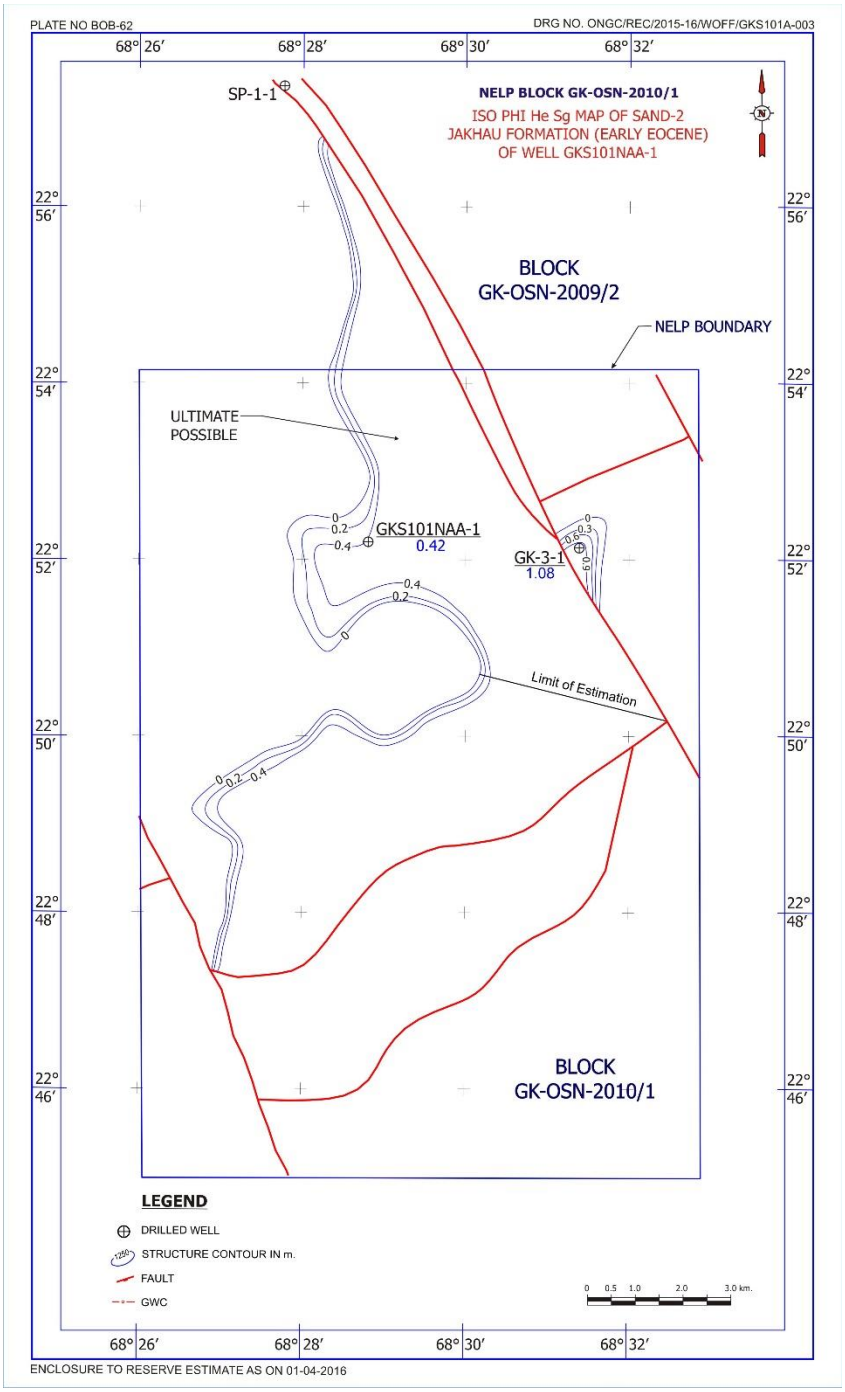


Figure 4-61: Iso PHI, He, Sg map of Sand-II Top, Early Eocene



4.4.6 Reservoir parameters and hydrocarbon estimates (GKS101NAA-1)

Structure and Product maps (Φ, He, Sg) of one object in Early Eocene pay (Object-II) in well GKS101NAA-1, equivalent of Sand-II, Early Eocene pay in well GK-3-1 are presented in Figure 4-58 - Figure 4-61. In-place Volumes were estimated based on these maps. For Early Eocene, Sand-II Pay (Object II- 1291.5-1301m), well GKS101NAA-1, Parameters used for in-place volume estimation of well GKS101NAA-1 are Φ- 28%, He 3.75m, Sg-40%, GWC 1301m and total area 25.526 SKM. The Gas Formation Volume Factor (Bg) of 0.00823813 calculated for gas in well GKS091NAA-1 (Object II) has been considered for volume estimation.

For Early Eocene, Sand-II Pay Equivalent (1236.5-1245.3m), well GK-3-1, where the pay was not tested in well GK-3-1. However, based on log signatures and gas saturation as observed in ELAN of well GK-3-1 and taking analogy from well GKS101NAA-1 parameters used for in-place volume estimation are Φ- 30%, He 6m, Sg-60% with GWC at 1245.3m as reference datum. A total area of 1.14 SKM has been considered. The Gas Formation Volume Factor (Bg) of 0.008547 calculated for gas in well GKS091NAA-1 (Object II) has been used for volume estimation.

Table 4-47: GKS101NAA-1 – GIIP and Recovery summary

Well	Pay	GIIP (BCM)
GKS101NAA-1	**Early Eocene SII**	**1.3014**
GK-3-1	Early Eocene SII	0.1441
	Total 2P	**1.3014 BCM**

Erstwhile Operator-reported estimates on record:

The GKS101NAA-1 and GK-3-1 have a reported gas estimate of:

- GKS101NAA-1 Early Eocene SII 1.285 **MMTOE**
- GK-3-1 Early Eocene SII 0.089 **MMTOE**

All these hydrocarbon estimates are subject to future assessments based on Operator's own technical insights and additional information/data, which may warrant possible revision of the currently reported estimates.

4.4.7 Production Facility for Oil & Gas Evacuation

Production facilities for Oil & Gas Evacuation are summarized in Table 4-48.

Table 4-48: GKS101NAA-1 Production facility for Oil & Gas Evacuation

Sl No	Discovery Name	Basin	Water Depth (mtr)	Oil/Gas	Initial Testing details Gas Rate	Pay sand	Depth of discovered reservoir (TVDSS)	Near-by surface Facility with distance
1	GK-1 (GKS092NAA-1)	Kutch Shallow Offshore	3.5	Gas	Qg=115168 m3/d through ½" choke		898-902 mtr	Upcoming SunPetro Dwarka Onshore Terminal (GK-28) : 120 KM.Cairn Suvali Plant: 489 KM
2	GKOSN-2009/1-D (GKS091NDA-1)	Kutch Shallow Offshore	18	Gas	1,80,000 m3/d	Jakhau (Jakhau & Early Eocene)	1450m	No Facility exists in the region. Planned for evacuation to Dwarka
3	GKS091NFA-1 (GKS091NFA-1)	Kutch Shallow Offshore	19	Gas	2,36,524 m3/d	Weathered Dolerite (Naliya & Mid Cretaceous)	3770m	No Facility exists in the region (Planned for evacuation to Dwarka)
4	GK-OSN-2010-1-A(GKS101NAA-1)	Kutch Shallow Offshore	16	Gas	45,873 m3/d through 1/2" choke, FTHP 250psi	Jakhau (Jakhau & Early Eocene)	1260m	No Facility exists in the region (Planned for evacuation to Dwarka)
5	GK-OSN-2010-1-C (GKS101NCA-1)	Kutch Shallow Offshore	32	Gas	1,63,000 m3/d	Chhasra FM (Chhasra & Mid Miocene)	880m	No Facility exists in the region (Planned for evacuation to Dwarka)
6	GSOSN-2004/1-A (GSS041NAA-1)	Kutch Shallow Offshore	99	Gas	35,597 m3/d (3/8")	Jhuran & Late Jurassic	4370m	Dwarka-115 KM
7	GSS041NAA-B (GSS041NAA-2)	Kutch Shallow Offshore	92	Gas	1,56,563 m3/d	Bhuj & Early Cretaceous	4370m	Dwarka-115 KM

4.4.8 Status of Additional Wells in the area (Polygon)

In GKOSN polygon, there are 14 wells drilled (GK-1-1, GK-1-2, GK-22C-1, GK-22C-2, GK-22C-3, GK-3-1, GK-40-1, GKS091NDA-1, GKS091NEA-1, GKS091NFA-1,GKS101NAA-1, GKS101NCA-1, GKS101NDA-1, GKS101NFA-1) of which GKS091NDA-1, GKS091NFA-1, GKS101NAA-1, GKS101NCA-1 are discovery wells. Additionally, GK-22C-1 also produced gas during initial testing. Data of all the wells other than discovery are given at 4.8

4.4.9 Main reports available for discovery well GKS101NAA-1

- Well Completion Report (WCR), June 2017
- Formation Evaluation report (FER), October 2016
- Reservoir Study Report (included in WCR) - May 2016
- Declaration of discovery (DoC), GK-OSN-2010/1, May 2019
- Post Drill Analysis Report, Sep 2016
- Formation Fluid Analysis

GK/OSDSF/GKOSN/2025 GKS101NCA-1 FIELD

4.5 DESCRIPTION OF KUTCH OFFSHORE GKS101NCA-1 (NELP Block GK-OSN-2010/1)

Discovery Well GKS101NCA-1 was drilled in the NELP Block GK-OSN-2010/1 with objective to explore hydrocarbon potential of Tertiary Sequence with a target depth 2150m (MSL) or 100m in Basement. The well GKS101NCA-1 was spud on 01.02.2017. The well has penetrated Kandla, Chhasra, Godhra, Narayan Sarovar, Tuna, Fulra, Jakhau, Nakhtarana Formation and was terminated after drilling 105m in Deccan Trap to a target depth of 2115m. The block GK-OSN-2010/1 with discoveries GKS101NAA-1 & GKS101NCA-1 is situated between blocks GK-OSN-2009/1 & GK-OSN-2009/2 in the north, GK-28 PML area in the south east and GS-OSN-2004/1 in the south. The water depth ranges from 20 to 90m in this block.

Discovery well GKS101NCA-1 is located South West of discovery GKS101NAA-1 in the block GK-OSN-2010/1. Discoveries GKS091NDA-1 & GKS091NFA-1 in the block GK-OSN-2009/1 have produced gas at different levels. Another well GK-22C-1, which is situated further north of GKS091NDA-1 (GK-OSN-2009/1) also flowed gas @ 2,80,850 m3/day from Early Cretaceous Bhuj Sandstone (2840-2845m). Other nearby hydrocarbon producing wells are in GK-28 & 42 area which are located South East of discoveries of the block GK-OSN-2010/1 also have gas discoveries from Tertiary Formations (Middle Miocene, Early Eocene and Paleocene). The cluster GK-28 & 42 is currently under development.

These two discoveries (GKS101NAA-1 & GKS101NCA-1) are part of this GKSN Polygon under the current DSF-IV offer.

4.5.1 Drilling and Well completion

In the cluster GKOSN, there are four discoveries GKS091NDA-1, GKS091NFA-1, GKS101NAA-1 & GKS101NCA-1 and 10 additional wells drilled in this polygon of the contract area. Key information of the GKS101NCA-1 has been collated and presented hereunder. This includes the Well Construction Diagram and the Litho-column Information.

4.5.1.1 Drilling and well completion

Key information of drilled wells has been collated and presented hereunder. The adjoining figures wherever shown illustrate the Well Construction Diagram (Figure 4-62) and the Litho-column Information (Figure 4-63) for key wells. Other well statics like kelly bush reference depth, water depth, drilled and logged depth including well coordinates are made available in Sections through various cross-references.

Figure 4-62: Well profile of GKS101NCA-1

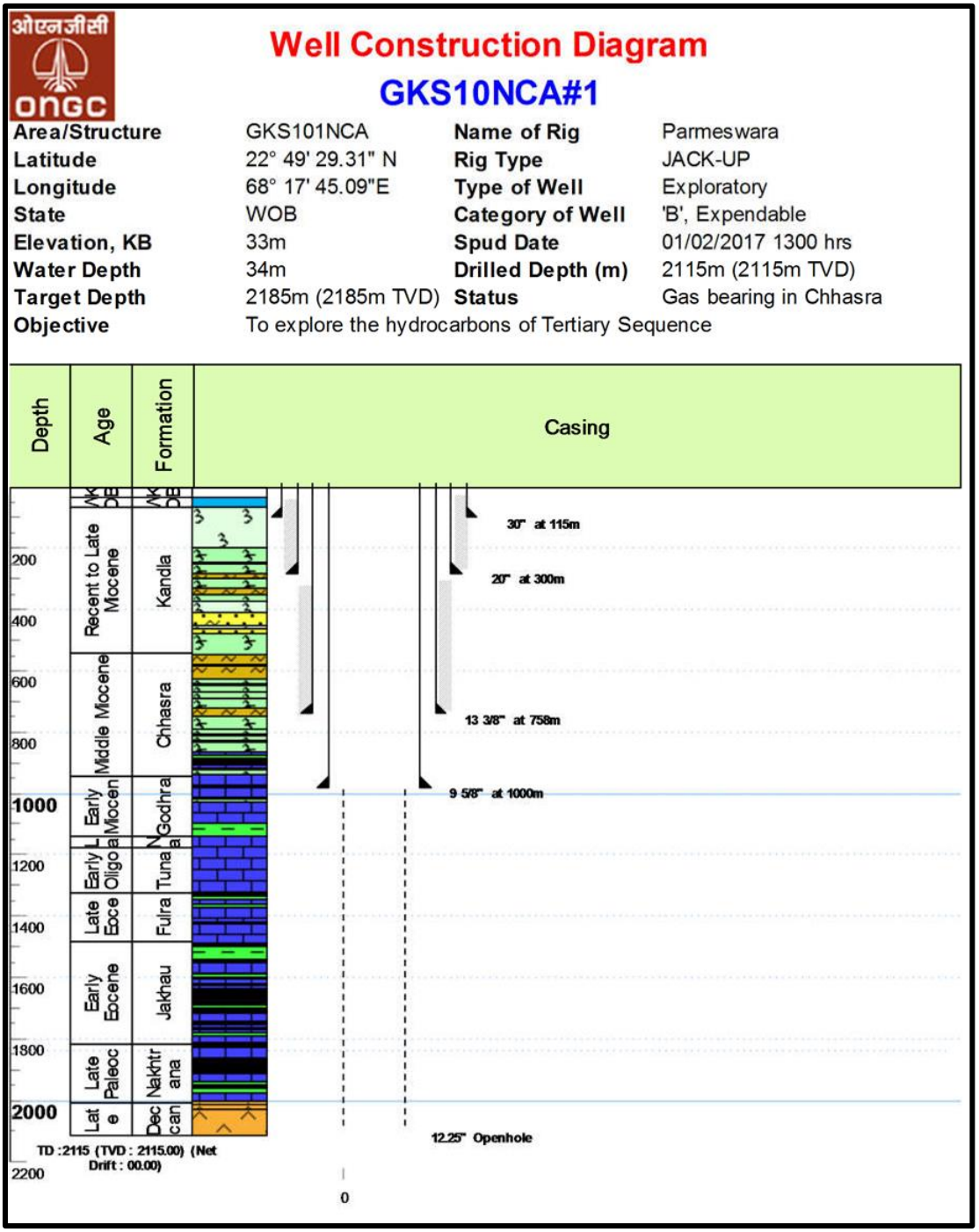
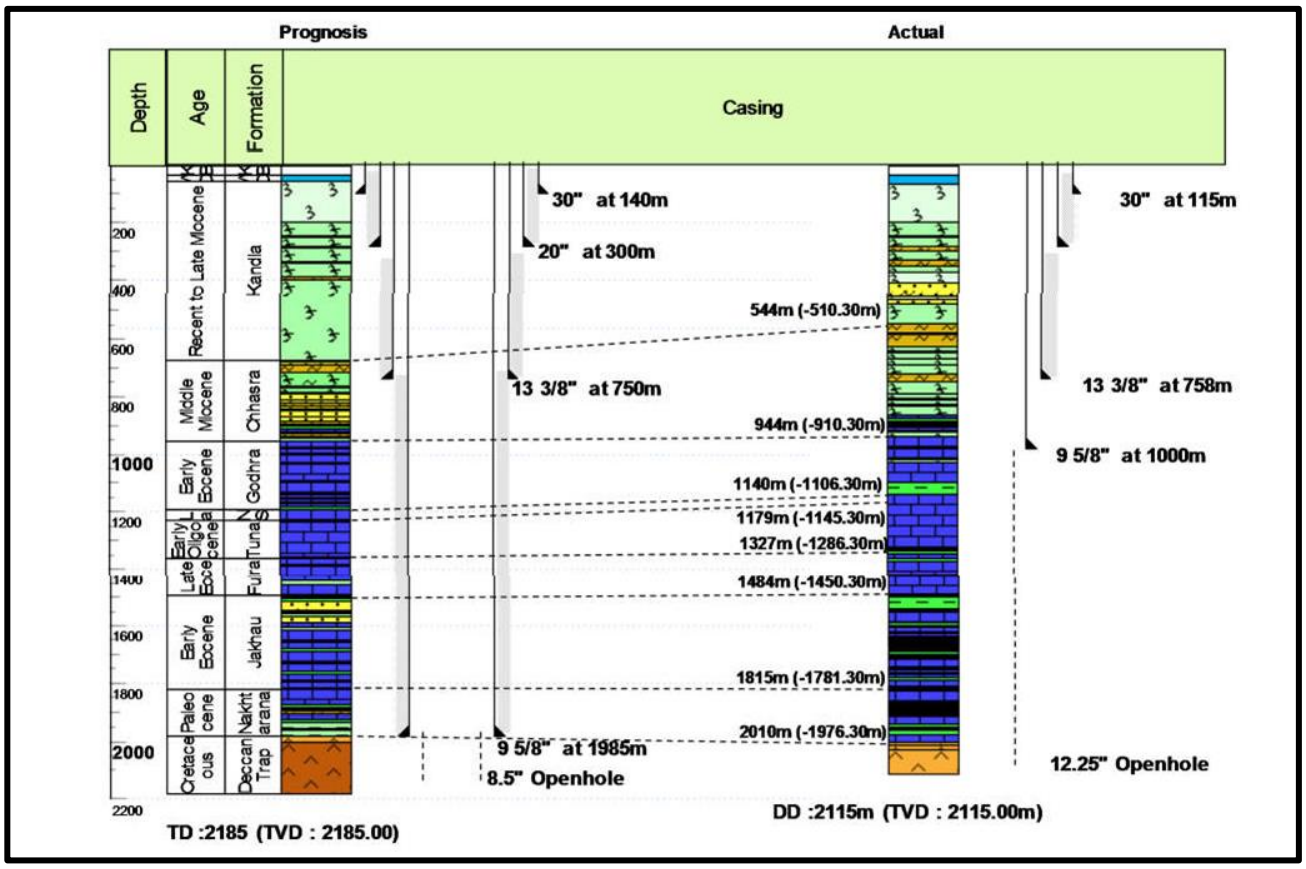


Figure 4-63: Prognosed vs Actual – Stratigraphy (GK101NCA-1)



4.5.2 Well logging and formation evaluation

The well logs of discovery well GKS101NCA-1 along with some key wells in the contract area have been reviewed. The logs recorded in various open-hole sections along with cased-hole logs and information of conventional and other wireline formation test data are presented in this docket.

The availability of key input reports like Well Completion Reports (WCR), Formation Evaluation Report (FER) and Declaration of Discovery for the Block GK-OSN-2010/1 have been checked and information given. Reservoir parameters of interesting zones and results of the tested zone(s) have been included in this report. Log motifs of tested/ interesting zone of key wells are also presented (refer to Figure 4-64 and Figure 4-67).

A) Well completion and log evaluation reports availability (GKS101NCA-1)

WCR/ FER availability	Spud date	KB	Drilled depth/Water Depth
WCR/FER available	01.02.2017	33 m	2115m/34m

B). Well logs acquired (GKS101NCA-1)

Logs recorded in the well GKS101NCA-1 are as given below:

a) **Logging While Drilling**

Sl. No.	Hole Size (")	Run	Date	Interval (m)		Data Recorded
				From	To	
1a	12 ¼	1	15.02.17-17.02.17	744	1250	Caliper, Gamma, Neutron, Density, Resistivity, Telemetry, Pressure
1b	12 ¼	2	19.02.17	1250	1327	
1c	12 ¼	3	20.02.17-26.02.17	1327	2028	

b) **Wireline Logging**

Sl. No.	Hole Size (")	Date	Interval (m)		Data Recorded	Remarks
			From	To		
1	17 ½	09.02.2017	737	299	PEX-HRLA-HNGS	Logger depth: 754m, BHT: 119.8°F
2	12 ¼	28.02.2017	2016	758	PEX-HRLA-HNGS	Logger depth: 2016m, BHT: 189°F
3	12 ¼	28.02.2017 - 01.03.2017	2014	758	DSI-FMI	BHT: 200°F
4	12 ¼	01.03.2017 - 02.03.2017	1981	916	MDT	BHT: 196°F, Total: 56, Good: 8, Tight: 27, Lost: 21
5	12 ¼	06.03.2017 - 07.03.2017	921	916	MDT	BHT: 148.5°F, Total: 5, Good: 4, Tight: 1
6	12 ¼	07.03.2017	1998 2014	758 772	DSI FMI	BHT: 200°F
7	12 ¼	07.03.2017	2107	1900	PEX-HRLA-HNGS	Logger depth: 2107m, BHT: 205°F

8	12 ¼	07.03.2017 - 08.03.2017	2107	758	ECS	BHT: 205°F
9	12 ¼	08.03.2017	2100	74	VSP	-
10	12 ¼	08.03.2017 - 09.03.2017	2093	917	MSCT	Attempted: 35, Recovered: 35, Accepted: 30
11	9 5/8	15.03.2017	962	7580	USIT-CBL-VDL	Cased hole

VSP was also taken between 2100-73.95m at every 15m in 12 ¼" hole.

C). Well log evaluation and initial test results (GKS101NCA-1)

In the discovery wells GKS101NCA-1 the block GK-OSN-2010/1, full set of logging data was acquired. On the basis of the log processing, and the geological information during drilling, reservoir characteristics, Middle Miocene Chhasra Formation in well GKS101NCA-1 were interpreted to be hydrocarbon bearing

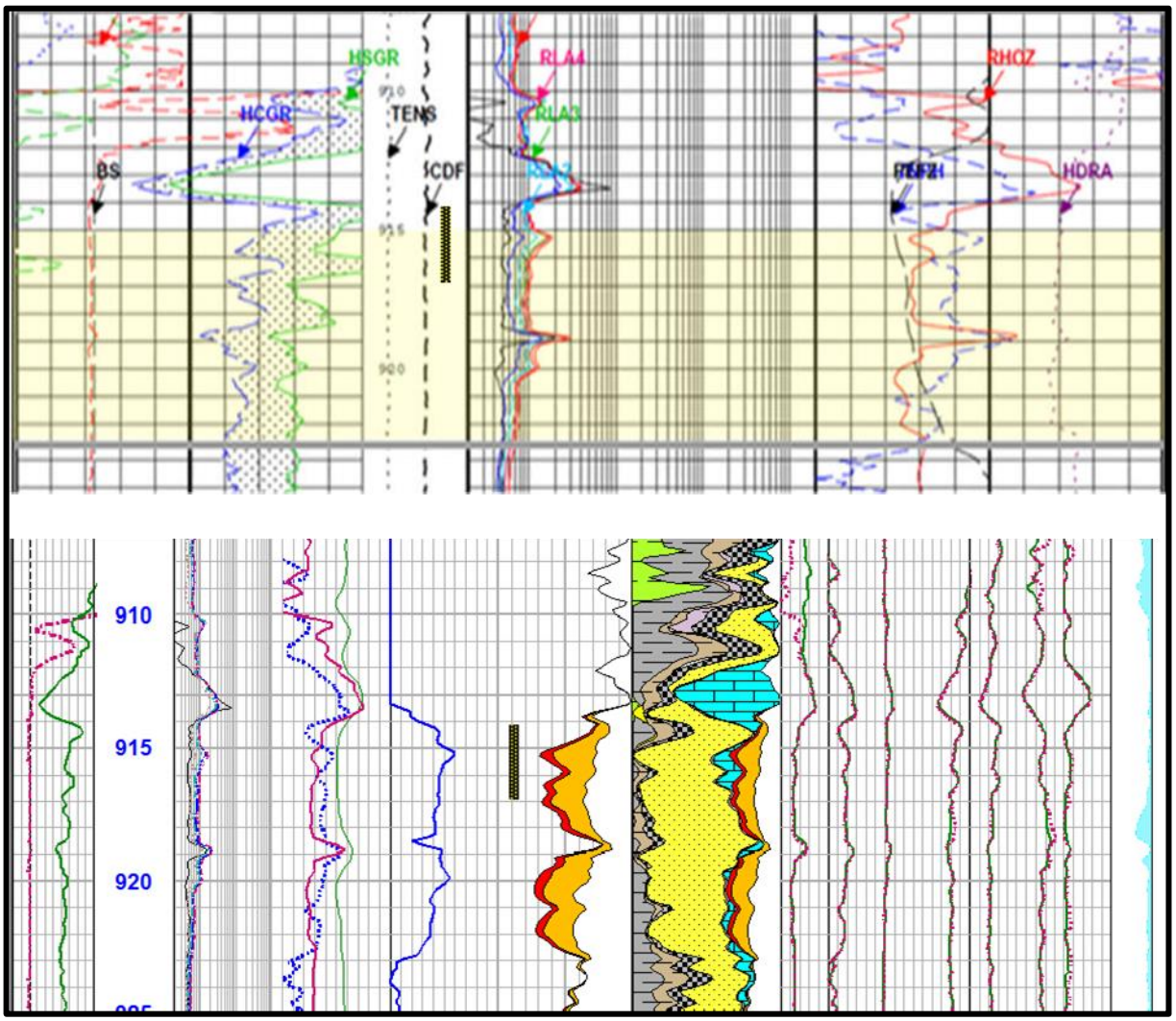
Object	Interval	Saturation	Porosity	Resistivity	Effective Pay Thickness (He)
		%	%	ohm.m	m
Object I GKS101NCA-1	914-917m	55	30-35	10-20	6.5

Summary of testing results in the well GKS101NCA-1 is presented in Table 4-49.

Table 4-49: GKS101NCA-1 test results summary

Sr. No	Well No	KB (m)	Obj. No	Interval (Pay zone)	Testing Results
1	GKS101NCA-1	33	I	914-917m (Chhasra/ Sandstone)	Flowed gas at rate of 2,20,000 m3/day (from 5/8" choke) FTHP:1010psi, FTHT:86°F

Figure 4-64: Log Motif & ELAN of the tested Object (GKS101NCA-1)



4.5.3 Well testing and workover history

In the well GKS101NCA-1, based on log characteristics and hydrocarbon show detected during drilling (Figure 4-64 and Figure 4-67), three objects were identified for production testing. Object-I was tested barefoot in Paleocene siltstone and weathered basalt. Object –II was tested in Early Eocene Sandstone and Object-III was tested in Fulra Limestone. Object-II produced gas.

Object-I (914-917 m), Chhasra/Sandstone

The well was tested through TCP-DST and it flowed gas as presented in Table 4-50.

Table 4-50: GKS101NCA-1 DST-TCP well test results for Object-I

Object No & interval	Bean Size (")	THP (PSI)	FTHT (˚F)	Qgas m3/day	STHP (PSI)	Remarks
Object I 914-917m	24/64	1100	70	99866		
	SHUTIN				1220	Closed for 6.30hrs buildup at surface
	8/64	1210	66	10219		
	16/64	1180	68	43919		
	24/64	1100	77	101347		
	SHUTIN					Closed for 44.79hrs buildup at downhole
	32/64	1010	86	163000		
	40/64	910	93.2	220000		51.5hrs surface buildup

4.5.4 Reservoir engineering studies and analysis

Key reservoir engineering datasets, wherever available have been collated and presented under various data genres. In a comprehensive data presentation, the results are included from well tests, formation dynamics tests, reservoir pressure build-up study and PVT data/ results.

4.5.4.1 Formation dynamics tests (GKS101NCA-1)

MDT was carried out at 61 preset points in 12 ¼" section, out of which 12 were good, 28 were tight and 21 lost seal. The good pretests are presented in Table 4-51.

Table 4-51: GKS101NCA-1 MDT test results in 12 ¼" section

Depth MDKB (m)	Formation Pressure (psi)	EMW (ppg)	Mobility (md/cp)	Temp. (°F)	Sampling/ FID/ Remarks
916.0	1325.9	8.49	142.4	15.27	Gas. Sampled
916.9	1326.5	8.48	146.1	5.58	FID-Gas
919.5	1326.89	8.46	147.6	16.68	Gas+Oil Traces+Water. Sampled
920.5	1326.2	8.45	148.5	41.44	Gas+Oil Traces+Water.

					Sampled
921.5	1328.5	8.451	147.7	11.55	Gas+water. Sampled
922.5	1327.24	8.44	142.1	39.74	Gas+Oil+Water. Sampled
925.0	1330.38	8.43	150.8	9.42	Water. Sampled
996.4	1436.69	8.45	144.6	5.97	-
999.2	1439.52	8.45	145	0.28	-
999.9	1440.96	8.45	144.4	3.95	-
1641	2383.2	8.51	171.4	1.81	Unsustainable pumping
1660	2408.62	8.51	180.2	78.04	Water. Sampled

4.5.4.2 Pressure Transient Study – Pressure Build up Study (GKS101NCA-1)

In the Object-I of well GKS101NCA-1, pressure Build up study and bean study was carried out. The main results of pressure studies are presented in Figure 4-65 - Figure 4-66 and Table 4-52 - Table 4-53.

Table 4-52: GKS101NCA-1 Bean Study

Choke (“)	Qg (m3/d)	Qc (bbl/d)	THP (PSI)	FTHT (Deg F)	Remarks
24/64	99866	Traces	1100	70	
Shut in			1220		Closed for 6.30 hrs Buildup at surface
8/64	10219		1210	66	
16/64	43919		1180	68	
24/64	101347		1100	77	
Shut in					Closed for 44.79hrs Buildup at Downhole
32/64	163000		1010	86	
40/64	220000		910	93.2	

Figure 4-65: GKS101NCA-1 Pressure Build-up Plot (Obj-I)

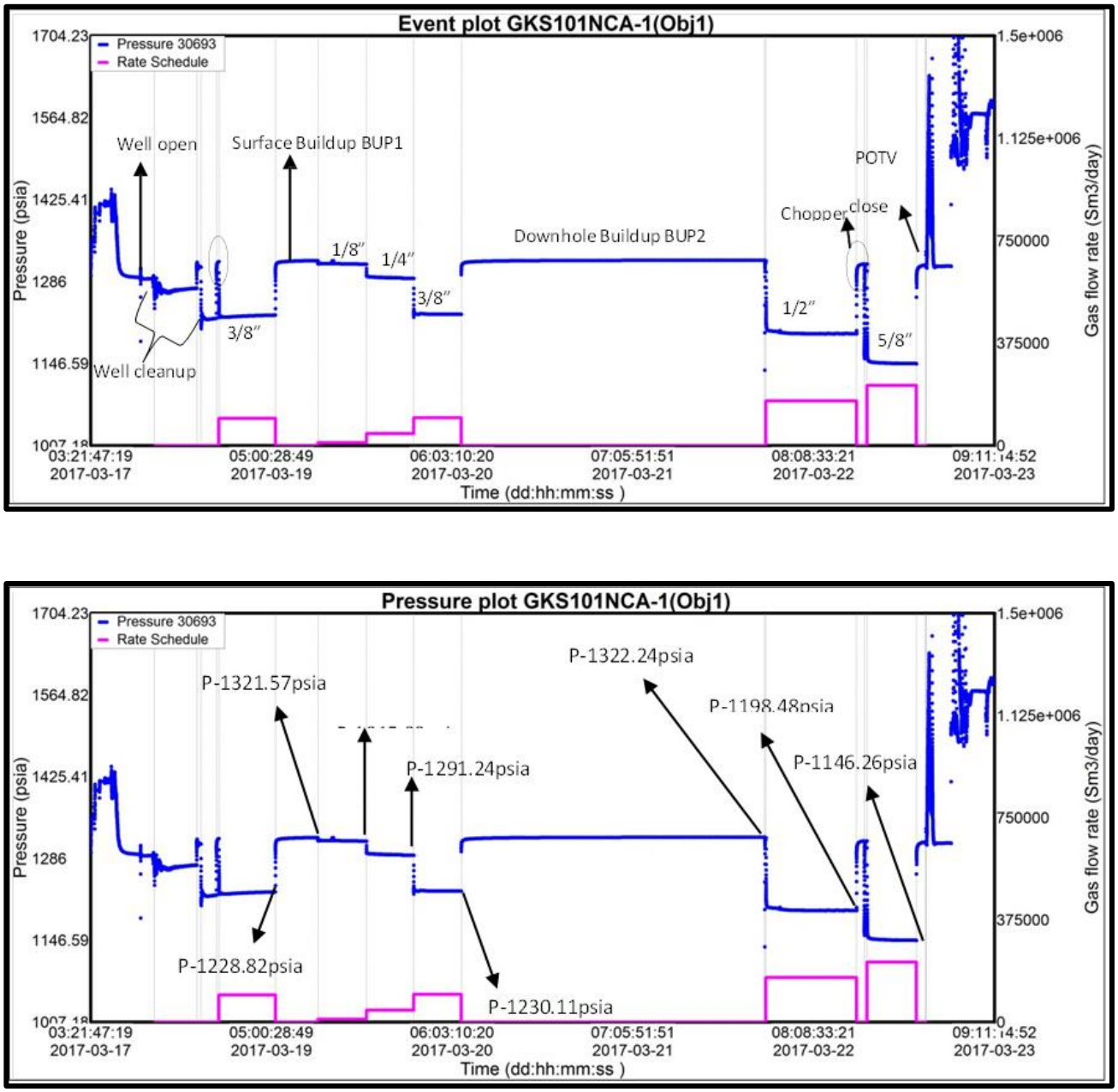


Figure 4-66: GKS101NCA-1 Sandface C&n Plot (Obj-I)

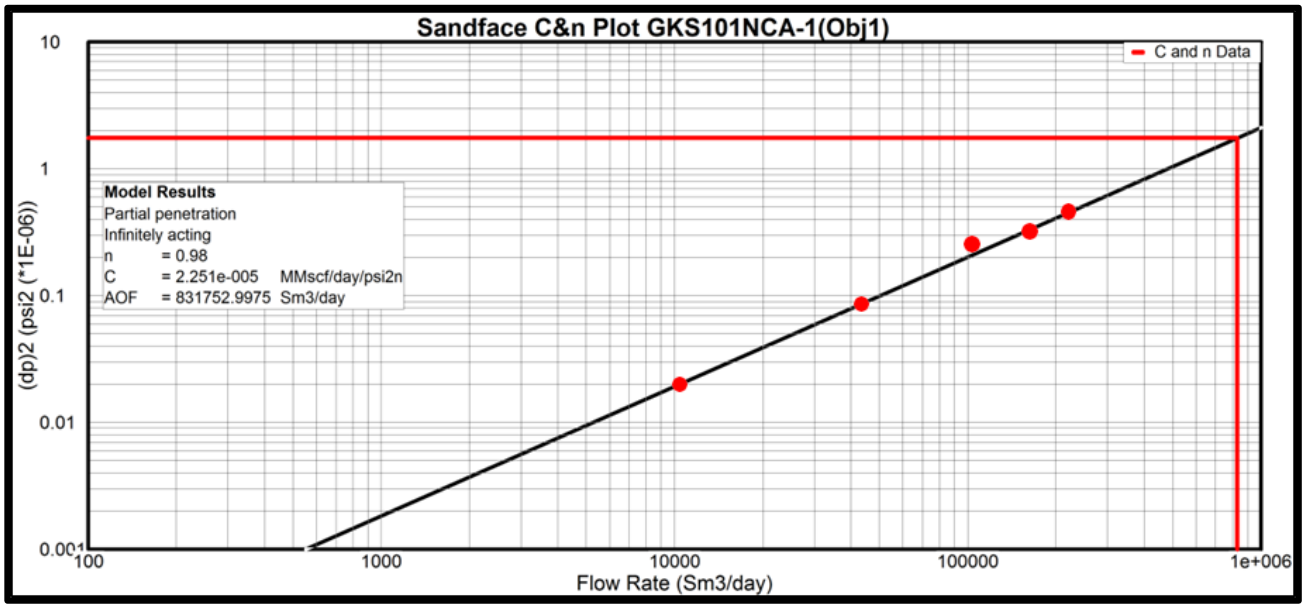


Table 4-53: GKS101NCA-1 – Pressure Build-up interpretation parameters, Object-I

Parameter	Results
Wellbore storage coefficient (bbl/psi)	0.005
Radial Permeability at perforation (md)	228.05
Vertical Permeability of (md)	1.9
Total skin (S_{pr})	(+ve)23.484
Mechanical skin	(+ve)8.292
Radius of investigation (ft)	2052
Extrapolated reservoir Pressure P*(Psia)	1322.7
AOFP, m3/day	831752

4.4.4.3 Gas composition analysis (GKS101NCA-1)

Gas composition results of Object-I are presented in Table 4-54.

Table 4-54: GKS101NCA-1 – Gas composition, Object-I

S. No	CONSTITUENT	VOLUME %
1	Methane	87.64
2	Ethane	3.60
3	Propane	1.70

4	Iso-Butane	0.38
5	N-Butane	0.58
6	Iso-Pentane	0.24
7	N-Pentane	0.22
8	Hexane+	0.45
9	Carbon Dioxide	0.04
10	Nitrogen	5.15
11	Helium (ppm)	BDL
12	H2S (ppm)	BDL
13	MOL. WT.	18.63
14	SP. GRAVITY	0.6446
15	NET CALORIFIC VALUE (KCAL/M^3)	8584

4.5.5 Geology and Reservoir Description of GKS101NCA-1

The geology of the area has been comprehensively reviewed using correlations, sections and maps. The well correlation, seismic sections, top structure, seismic attribute/amplitude and net sand/pay maps have been used to illustrate the magnitude and distribution of key reservoir properties in and around the discovered oil/gas pools (accumulations). The local tectonic setting and geological section of the area, wherever available are also given. These maps/sections are sequentially shown field-wise and reservoir unit-wise through figures, appropriately titled and illustrated in the following section.

A). Geological correlations, sections and maps (GKS101NCA-1)

Well GKS101NCA-1 was proposed with an objective to explore the hydrocarbon potential of Tertiary Sequence. The well was identified on a four way closure at Early Eocene and Early Miocene level. The well encountered normal pressure regime. The well has penetrated the normal sequences of Kandla, Chhasra, Godhra, Narayan Sarovar, Tuna, Fulra, Jakhau, Nakhtarana and Deccan Trap Formations. During drilling (refer to Figure 4-68), Gas shows were observed within Chasra (Max. T.G:4.12%), Godhra (Max. T.G:1.41%), Jakhau (Max. T.G:2.05%) and Nakhtarana Formation (Max. T.G:1.49%). Yellow fluorescence and milky white cut were observed in cuttings from 925-926m, 946-948m and 995- 1000m. Hydrocarbon shows were also observed in top part of conventional core cut from 948- 957m and side wall cores taken at 920,924 and 925m. MDT samples collected at 916m gave gas and FID sample collected at 921.5m and 922.5m yielded gas with water.

The well GKS101NCA-1 (refer to Figure 4-69) is structurally shallower w.r.t GK-1-1, GK-1-2 and deeper w.r.t GK-40-1, GKS101NAA-1 &GK-3-1. Mid Miocene sand is developed only in well GKS101NCA-1 (refer to Figure 4-70 - Figure 4-73) and it is silty and shaly in other wells. Early Eocene sand-II is mainly silty in well GKS101NCA-1. Early Eocene sand-I is developed in this well but interpreted to be devoid of hydrocarbons.

Figure 4-67: Log motif GKS101NCA-1

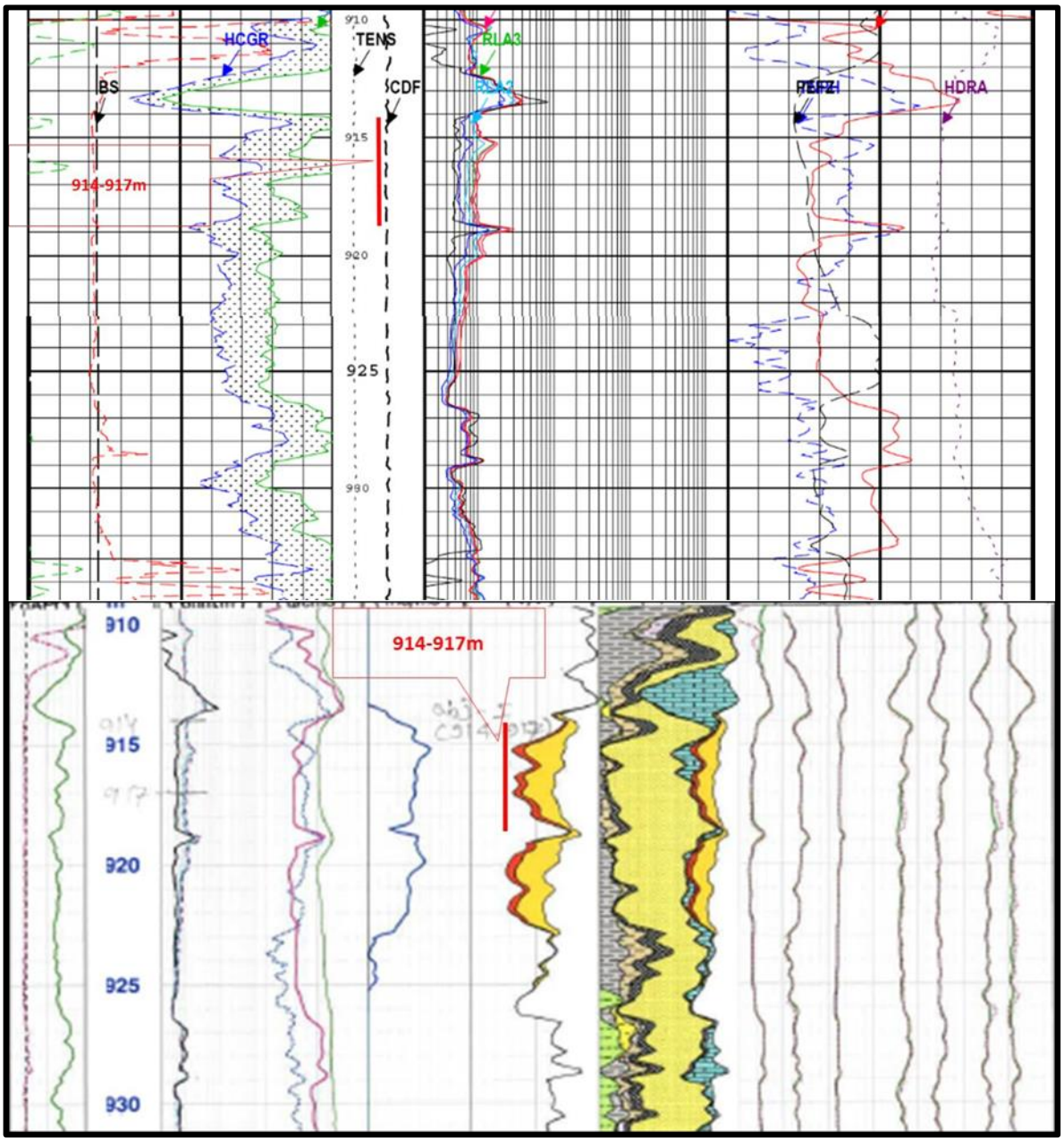


Figure 4-68: Well Log Correlation

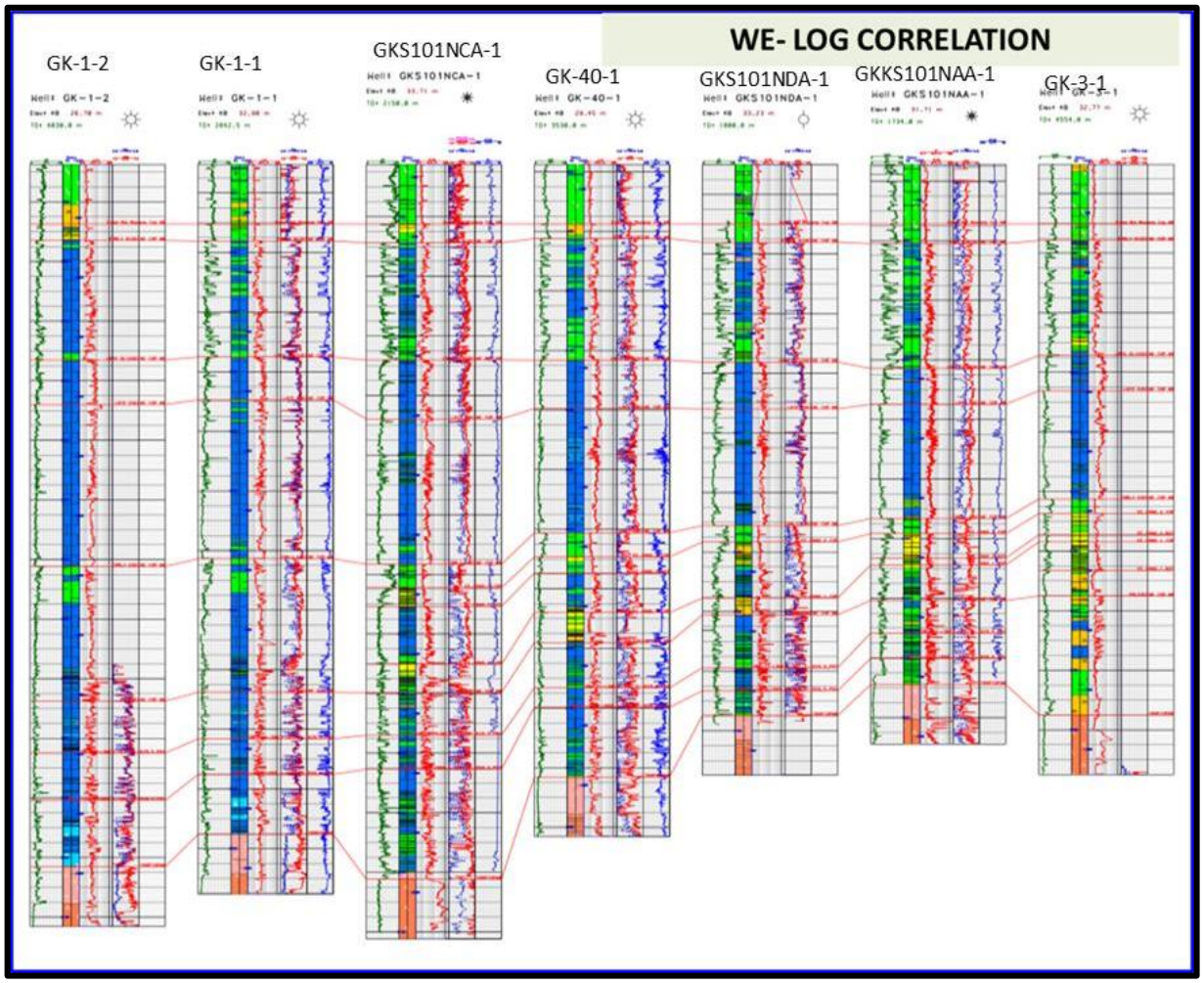
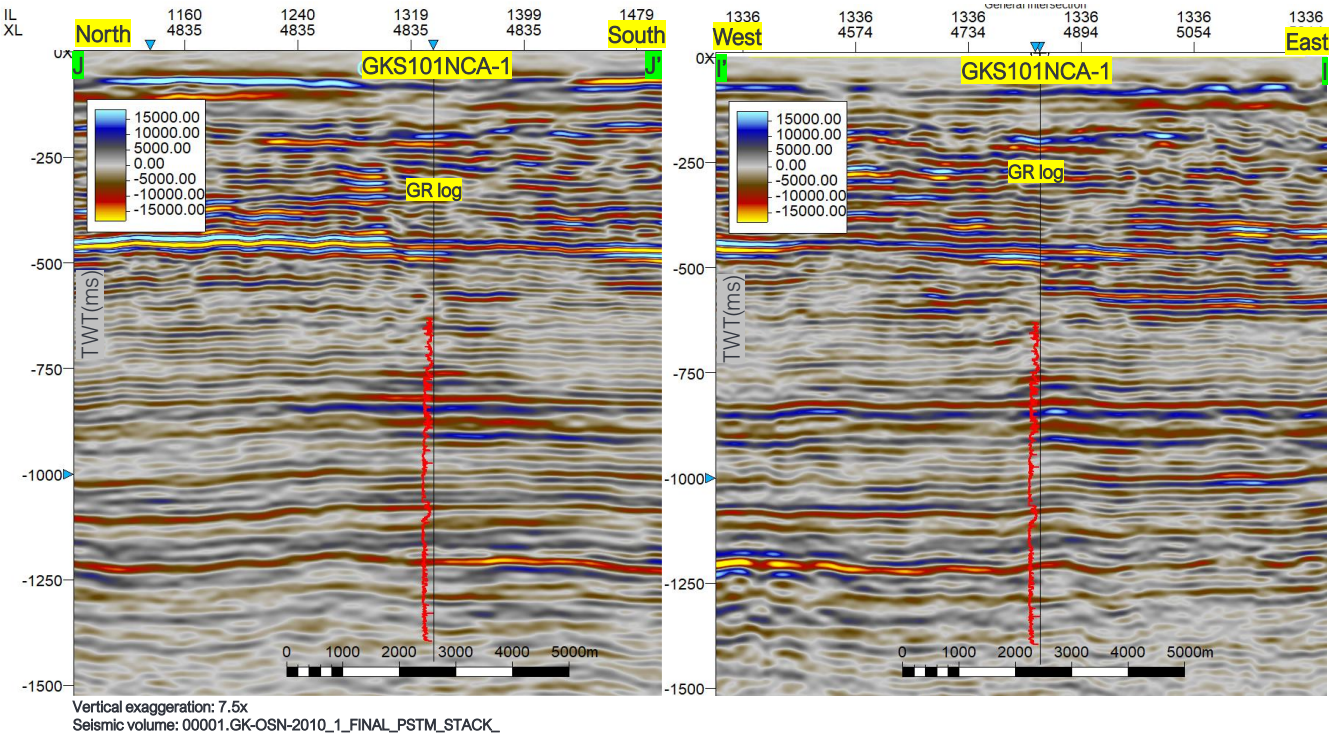
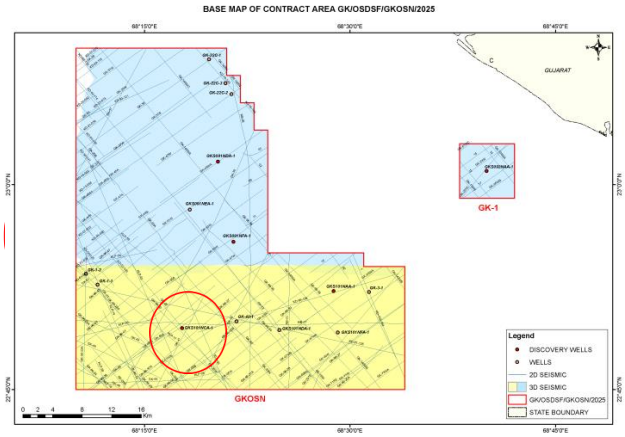


Figure 4-69: Seismic cross-sections passing through well GKS101NCA-1





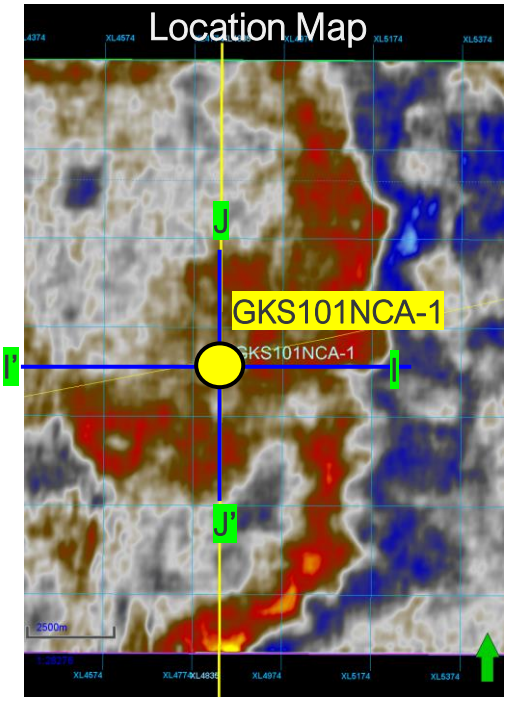


Figure 4-70: Structure map at Middle Miocene Top

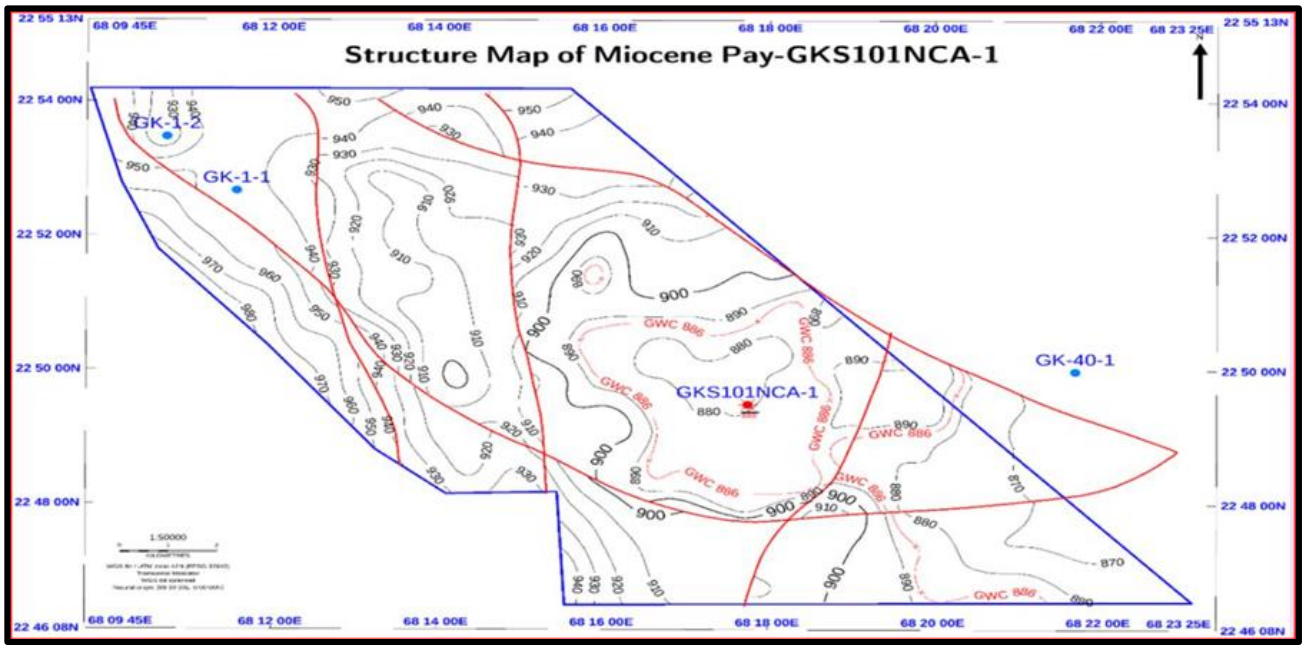


Figure 4-71: Structure map at Middle Miocene Top

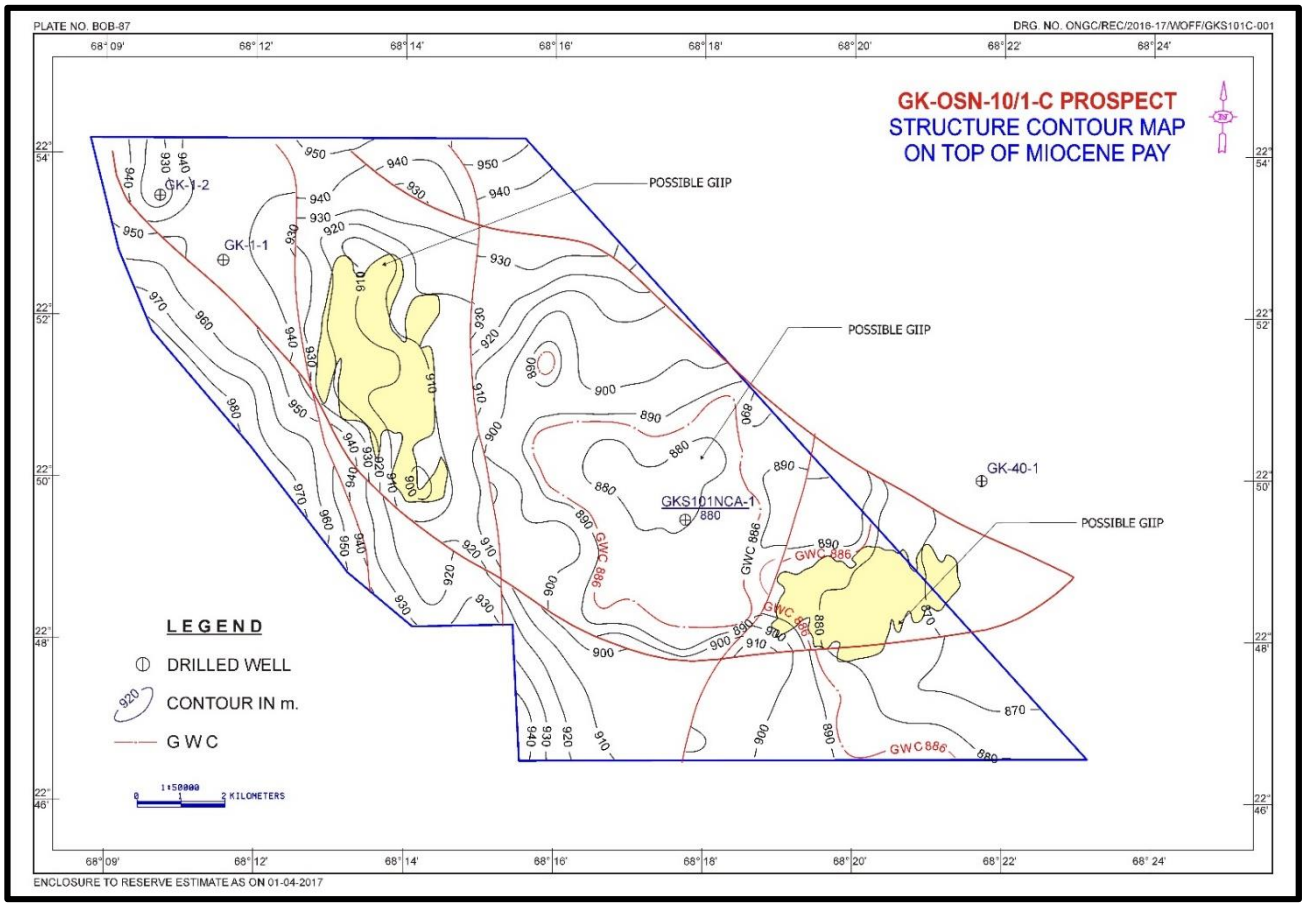


Figure 4-72: Iso gas Pay of Miocene Pay

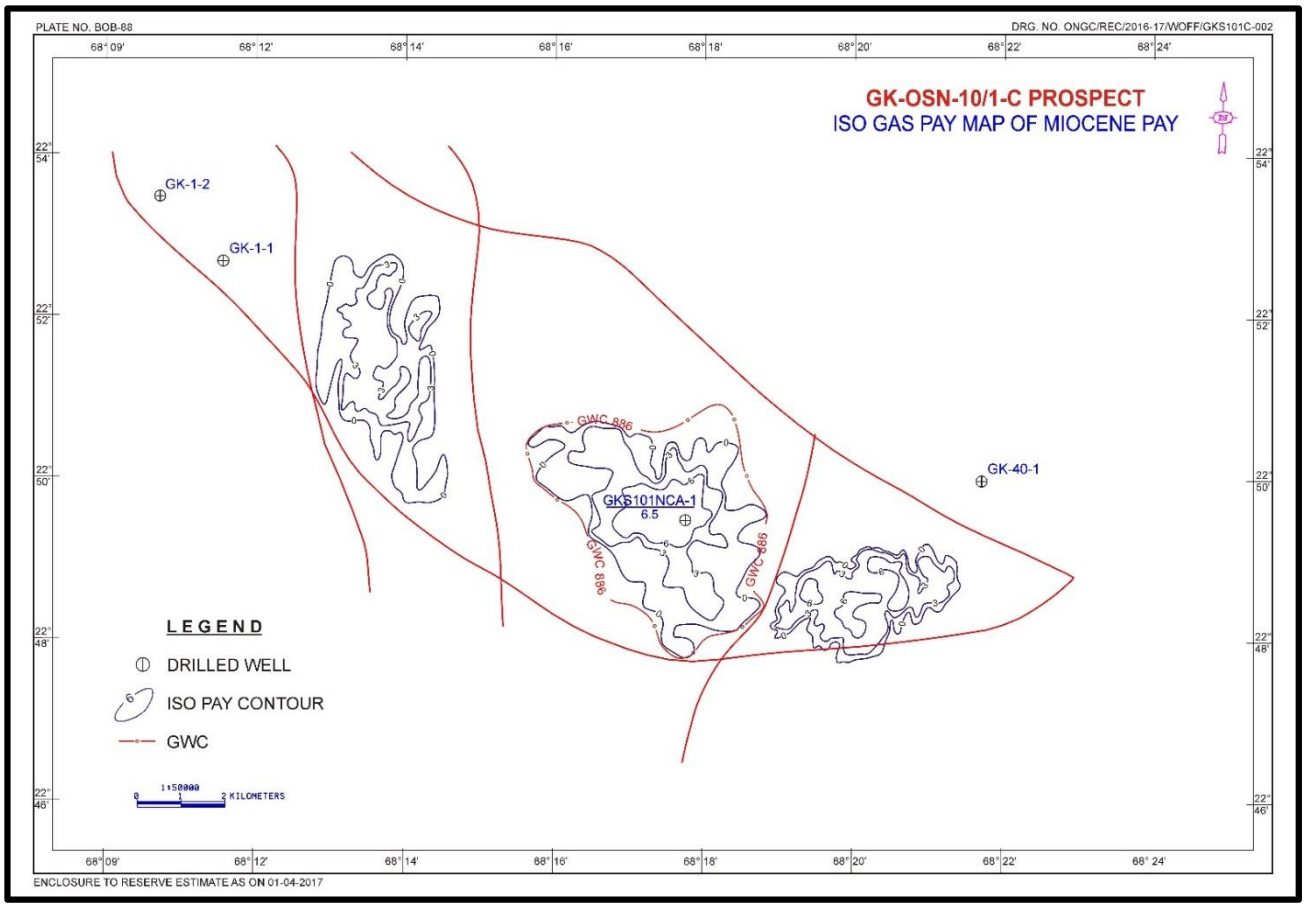
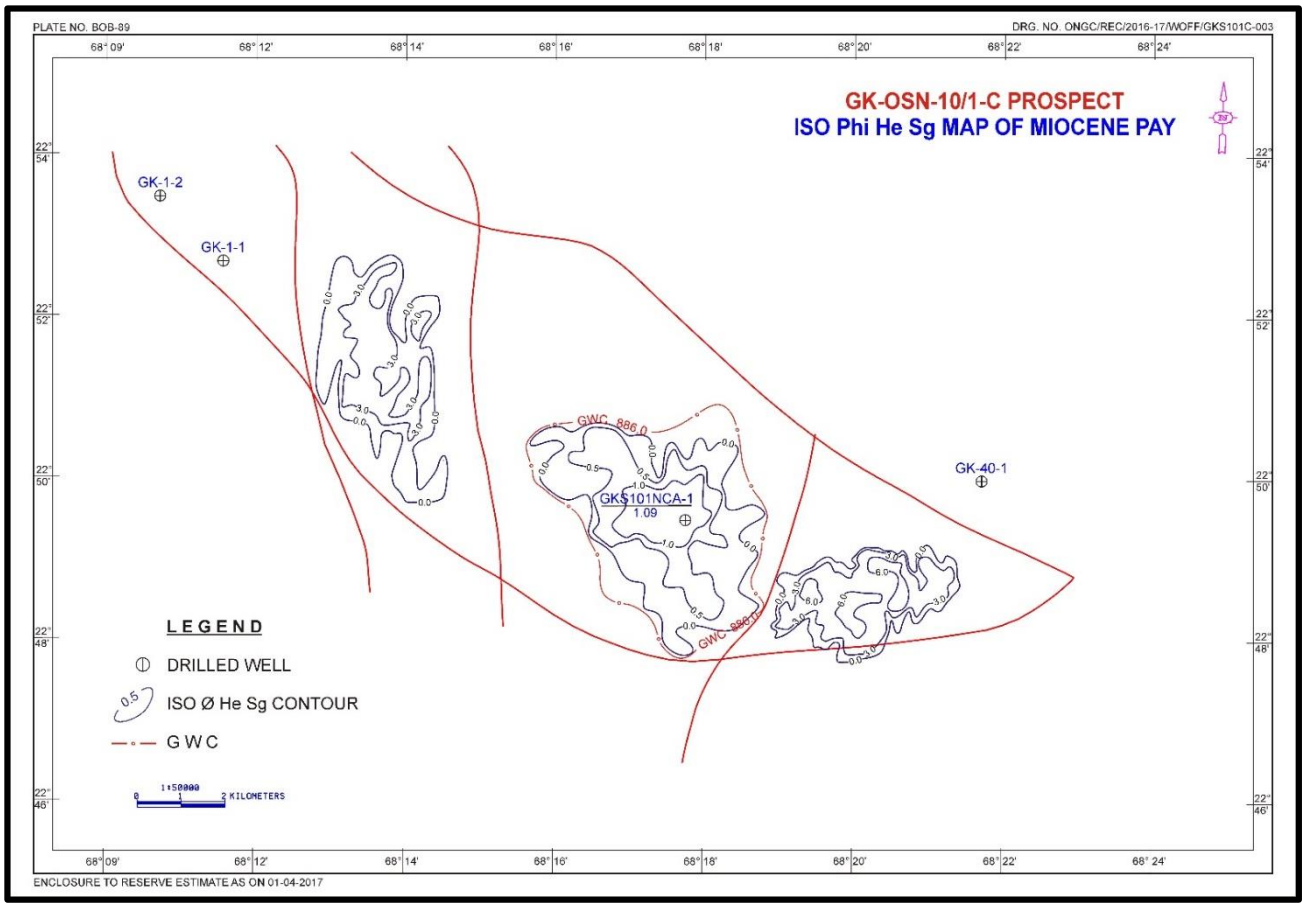


Figure 4-73: ISO Phi He Sg Miocene Pay



4.5.6 Reservoir parameters and hydrocarbon estimates (GKS101NCA-1)

The estimates of hydrocarbon in-place have been worked out under various field assumptions. All inputs, working and results, as available are presented in the following section.

Structure, Iso pay and Product maps (Φ, He, Sg) of Middle Miocene pay (Object-I) in well GKS101NCA-1 has been prepared (refer to Figure 4-70 - Figure 4-73). In-place Volumes (refer to Table 4-55) were estimated based on these maps.

Middle Miocene Sandstone Object I (914-920m) Pay, well GKS101NCA-1

Parameters used for in-place volume estimation are Φ- 32%, He 6.1m, Sg-55% with GWC at 920.5m as reference datum. A total area of 15.545 SKM has been considered from MNA attribute map. The Gas Formation Volume Factor (Bg) of 0.012225 calculated for gas in well GKS101NCA-1 (Object I, Middle Miocene) has been used for volume estimation.

Based on the same MNA attribute map volumes have also been estimated Northwest and southeast of the drilled well GKS101NCA-1.

- In the northwestern part the parameters used for volume estimation are Φ- 32%, He 6m, Sg-55% with GWC at 920.5m as reference datum. A total area of 10.088 SKM has been considered from

MNA attribute map.

- In the southeastern part the parameters used for volume estimation are Φ- 32%, He 6m, Sg-55% with GWC at 922m as reference datum. A total area of 7.453 SKM has been considered from MNA attribute map. The Gas Formation Volume Factor (Bg) of 0.012225 calculated for gas in well GKS101NCA-1 (Object I, Middle Miocene) has been used for volume estimation in both the northwestern and southeastern parts.

Table 4-55: GKS101NCA-1 – GIIP and Recovery summary

Well	Pay	GIIP (BCM)
GKS101NCA-1	**Middle Miocene**	**1.3652**
NW of GKS101NCA-1	Middle Miocene	0.8714
SE of GKS101NCA-1	Middle Miocene	0.6438
Total 2P		**1.3652 BCM**

Erstwhile Operator-reported estimates on record:

The GKS101NCA-1 have a reported gas estimate of:

- GKS101NAA-1 Middle Miocene 0.723 **MMTOE**
- NW of GKS101NCA-1 Middle Miocene 0.307 **MMTOE**
- SE of GKS101NCA-1 Middle Miocene 0.430 **MMTOE**

All these hydrocarbon estimates (refer to Table 4-55) are subject to future assessments based on Operator's own technical insights and additional information/data, which may warrant possible revision of the currently reported estimates.

4.5.7 Production Facility for Oil & Gas Evacuation

Production facilities for Oil & Gas Evacuation are summarized in Table 4-56.

Table 4-56: GKS101NCA-1 Production facility for Oil & Gas Evacuation

Sl No	Discovery Name	Basin	Water Depth (mtr)	Oil/Gas	Initial Testing details Gas Rate	Pay sand	Depth of discovered reservoir (TVDSS)	Near-by surface Facility with distance
1	GK-1 (GKS092NAA-1)	Kutch Shallow Offshore	3.5	Gas	Qg=115168 m3/d through ½" choke		898-902 mtr	Upcoming SunPetro Dwarka Onshore Terminal (GK-28) : 120 KM.Cairn Suvali Plant: 489 KM
2	GKOSN-2009/1-D (GKS091NDA-1)	Kutch Shallow Offshore	18	Gas	1,80,000 m3/d	Jakhau (Jakhau & Early Eocene)	1450m	No Facility exists in the region. Planned for evacuation to Dwarka
3	GKS091NFA-1 (GKS091NFA-1)	Kutch Shallow Offshore	19	Gas	2,36,524 m3/d	Weathered Dolerite (Naliya & Mid Cretaceous)	3770m	No Facility exists in the region (Planned for evacuation to Dwarka)
4	GK-OSN-2010-1-A(GKS101NAA-1)	Kutch Shallow Offshore	16	Gas	45,873 m3/d through 1/2" choke, FTHP 250psi	Jakhau (Jakhau & Early Eocene)	1260m	No Facility exists in the region (Planned for evacuation to Dwarka)
5	GK-OSN-2010-1-C (GKS101NCA-1)	Kutch Shallow Offshore	32	Gas	1,63,000 m3/d	Chhasra FM (Chhasra & Mid Miocene)	880m	No Facility exists in the region (Planned for evacuation to Dwarka)
6	GSOSN-2004/1-A (GSS041NAA-1)	Kutch Shallow Offshore	99	Gas	35,597 m3/d (3/8")	Jhuran & Late Jurassic	4370m	Dwarka-115 KM
7	GSS041NAA-B (GSS041NAA-2)	Kutch Shallow Offshore	92	Gas	1,56,563 m3/d	Bhuj & Early Cretaceous	4370m	Dwarka-115 KM

4.5.8 Status of Additional Wells in the area (Polygon)

In GKOSN polygon, there are 14 wells drilled (GK-1-1, GK-1-2, GK-22C-1, GK-22C-2, GK-22C-3, GK-3-1, GK-40-1, GKS091NDA-1, GKS091NEA-1, GKS091NFA-1,GKS101NAA-1, GKS101NCA-1, GKS101NDA-1, GKS101NFA-1) of which GKS091NDA-1, GKS091NFA-1, GKS101NAA-1, GKS101NCA-1 are discovery wells. Additionally, GK-22C-1 also produced gas during initial testing. Data of all the wells other than discovery are given at 4.8

4.5.9 Main reports available for discovery well GKS101NCA-1

- Well Completion Report (WCR), Feb 2018
- Reservoir Study Report (included in WCR) - April 2017
- Declaration of discovery (DoC), GK-OSN-2010/1, May 2019
- Formation Fluid Analysis

GK/OSDSF/GKOSN/2025 GSS041NAA-1 FIELD

4.6 DESCRIPTION OF KUTCH OFFSHORE GSS041NAA-1 (NELP Block GS-OSN-2004/1)

Well GSS041NAA-1, was drilled with a target depth of 4500 m which was revised to 5267m, with the objective of exploring the hydrocarbon potential of Mesozoic sequence and Tertiary sediments. The structure is a fault closure with a fault to the east having an axial trend roughly in NNW-SSE direction and is bounded by a big low in the south. In the north, a structural nose protrudes and runs further north, bounded by N-S trending inversion faults on either side. This extensive inverted three way closure amplitude of 300 m at Jurassic level measures an area of 214 km^2. The Mesozoic structurisation against the deep seated faults provides a similar trapping mechanism which yielded hydrocarbon in the discovery well GK-28-2, located further northeast of this block. The closure can also be mapped at all Tertiary levels and the areal extent comes out to be 180 km^2 at Paleocene and 193 km^2 at Eocene.

The well was drilled in the NELP Block GS-OSN-2004/1 which is situated south of Block GK-OSN-2010/1 with discoveries GKS101NAA-1 & GKS101NCA-1. Further in the north, blocks GK-OSN-2009/1 & GK-OSN-2009/2 have gas discoveries and GK-28/42 PML area in the North East also have discoveries which are currently under development. Another well GK-22C-1, which is situated further north of GKS091NDA-1 also flowed gas from Early Cretaceous Bhuj Sandstone.

The well GSS041NAA-1 was spudded on 19.01.2011 and drilled down to 4616 m and the well depth was enhanced by 50 m to evaluate the bottom sand encountered at 4616 m and to ensure the placement of float collar below the zone of interest. Hence, the well was further drilled down to 4666 m. At this depth again, development of sand was observed during drilling. In view of continuous development of sand in the well it was decided to increase the well depth by another 600 m and drill upto 5267 m. Finally, the well was drilled down to 4887m. Total five objects were identified out of which 3 objects were tested.

These two discoveries (GSS041NAA-1 & GSS041NAA-2 in the Block GS-OSN-2004/1) are part of GSOSN Polygon under the current DSF-IV offer.

4.6.1 Drilling and Well completion

In the cluster GSOSN, there are four wells in the polygon of which two are gas discoveries GSS041NAA-1 & GSS041NAA-2 and two additional wells i.e. GSS041NAA-3 & SOE-3. Well GSS041NAA-1, GSS041NAA-2 & GSS041NAA-3 produced gas. Key information of the GSS041NAA-1 has been collated and presented hereunder. This includes the Well Construction Diagram (Figure 4-74) and the Litho-column Information (Figure 4-75). Other well statics like kelly bush, reference depth, water depth, drilled and logged depth including well coordinates are made available in Sections through various cross-references.

Figure 4-74: Well construction Diagram GSSA041NAA-1

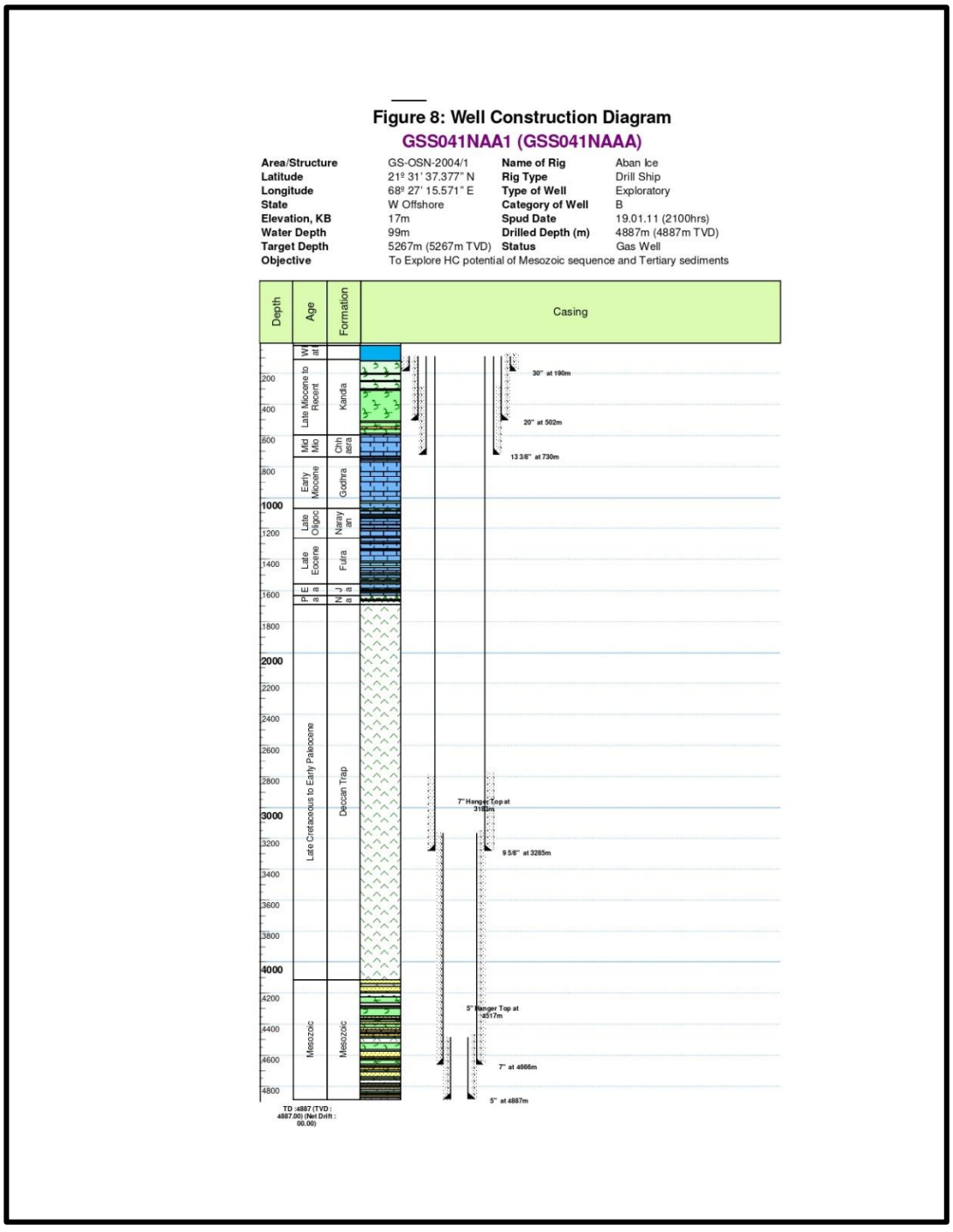
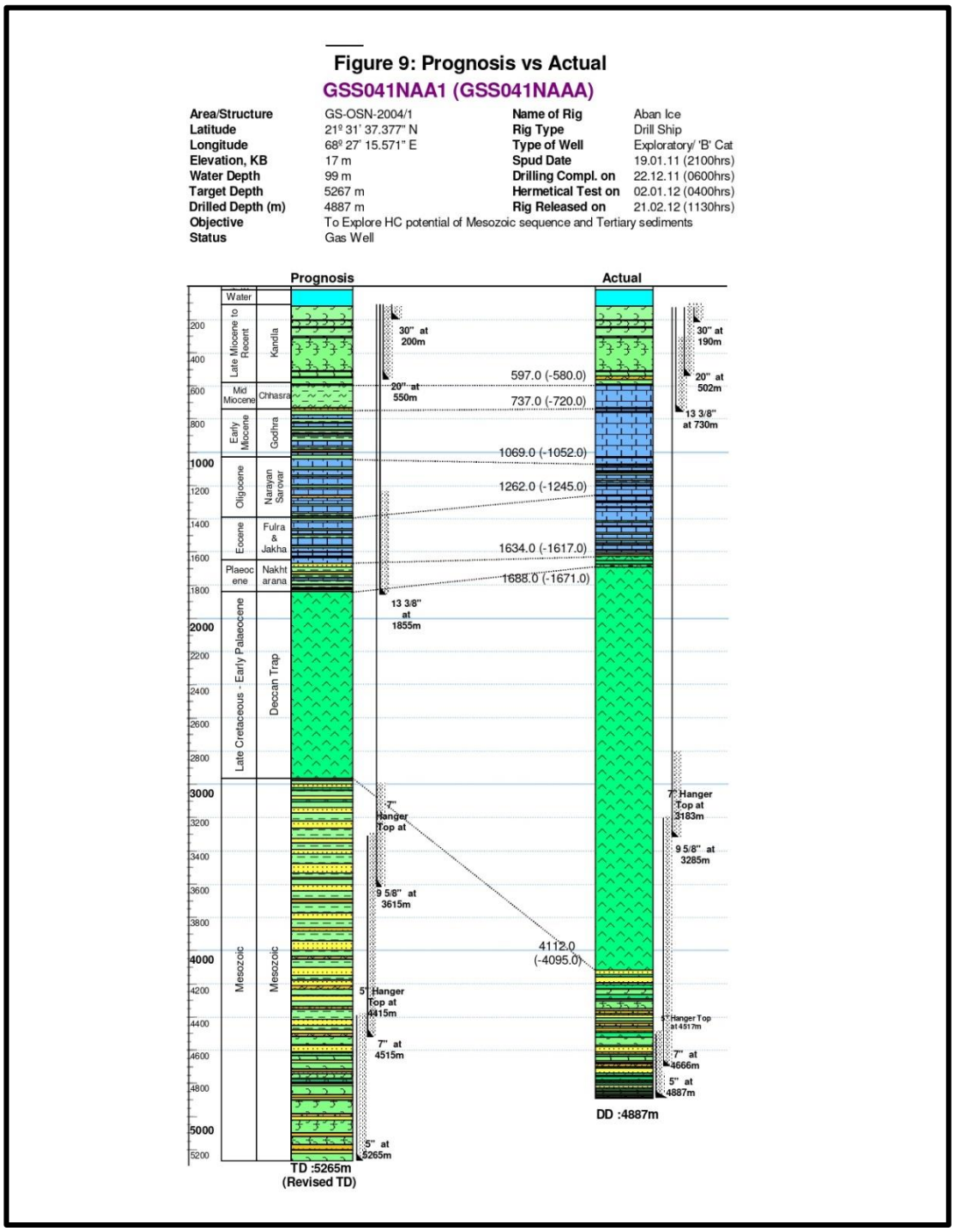


Figure 4-75: GSS041NAA1 Prognosis vs. Actual Log



4.6.2 Well logging and formation evaluation

The well logs of discovery well GS041NAA-1 along with some key wells in the contract area have been reviewed. The logs recorded in various open-hole sections along with cased-hole logs and information of conventional and other wireline formation test data are presented in this docket.

The availability of key input reports like Well Completion Reports (WCR), Formation Evaluation Report (FER) and Declaration of Discovery for the Block GS-OSN-2004/1 have been checked and information given. Reservoir parameters of interesting zones and results of the tested zone(s) have been included in

this report. Log motifs of tested/ interesting zone of key wells are also appended (refer to Figure 4-76 - Figure 4-79).

A) Well completion and log evaluation reports availability (GSS041NAA-1)

WCR/ FER availability	Spud date	KB	Drilled depth/Water Depth
WCR/FER available	19.01.2011	17 m	4887 m/99m

B). Well logs acquired (GSS041NAA-1)

Logs recorded in the well GSS041NAA-1 are as given below:

No	Hole/ Casing Size (in)	Date	Interval (m)	Logs	Remarks
1	12 ¼" (Pilot hole)	10.02.2011	1571.09-503.28	GR-DAL-DLL-MLL	Logging tools got held up at 1572 m. BHT: 130°F MF Sal: 43000 ppm RM: 0.195 ohm-m @ 79.5°F RMF: 0.156 ohm-m @ 79.5°F RMC: 0.27 ohm-m @ 79.5°F
2	12 ¼" (Pilot hole)	10.02.2011	1571.09-503.28	GR-SONIC-CAL-ORIT	Logging tools got held up at 1572 m. BHT: 130°F MF Sal: 43000 ppm RM: 0.195 ohm-m @ 79.5°F RMF: 0.156 ohm-m @ 79.5°F RMC: 0.27 ohm-m @ 79.5°F
3	12 ¼" (Pilot hole)	11.02.2011-12.02.2011	1889-503.28	GR-CN-ZDL	BHT: 136°F MF Sal: 43000 ppm. RM: 0.195 ohm-m @ 79.5°F RMF: 0.156 ohm-m @ 79.5°F RMC: 0.27 ohm-m @ 79.5°F
4	12 ¼" (Pilot hole)	12.02.2011	1889-503.28	DSL-DLL-MLL-DAL-ORIT-CAL-GR	BHT: 136°F MF Sal: 43000 ppm. RM: 0.195 ohm-m @ 79.5°F RMF: 0.156 ohm-m @ 79.5°F RMC: 0.27 ohm-m @ 79.5°F
5	12 ¼" (Pilot hole)	12.02.2011-13.02.2011	541-1873	SWC	50 attempted, 14 accepted.
6	12 ¼" & 20"	14.02.11-15.02.11	265-1810	VSP	Zero off set recorded @ 15 m interval with source offset at 35 m due N 132°

7	12 ¼" (Pilot hole)	14.02.2011-17.02.2011	548-620	RCI	48 Pressure tests and 10 Sample tests
8	17 ½"	07.03.2011	1783.3-503.25	ORIENT-CAL-GR	BHT: 145°F MF Sal: 46000 ppm (Recorded for borehole profile)
9	13 3/8"	14.03.2011	503-694	CCL	Split shot Correlation log
10	12 ¼"	23.04.2011-24.04.2011	1610 - 3260	VSP	Zero off set recorded @ 15 m interval with source offset at 35 m due N 135°
11	12 ¼"	24.04.2011	3297.17 - 1807	X-MAC	BHT: 214°F MF Sal: 45366 ppm. RM: 0.083 ohm-m @ 71°F RMF: 0.05 ohm-m @ 71°F RMC: 0.132 ohm-m @ 71°F
12	12 ¼"	24.04.2011	3289 - 1807	RTEX-CN-ZDL- GR-ORIT-CAL- SP	BHT: 217°F MF Sal: 45366 ppm. RM: 0.083 ohm-m @ 71°F RMF: 0.05 ohm-m @ 71°F RMC: 0.132 ohm-m @ 71°F
13	8 ½"	28.10.2011	4617-3288	L-MLL-XMAC-CAL-GR-SP	BHT: 287 °F MF Sal: 49490 ppm. RM: 0.09ohm-m @ 72°F RMF: 0.07 ohm-m @ 72°F RMC: 0.12 ohm-m @ 72°F
14	8 ½"	29.10.2011	4619.2 - 3288	GR-CAL-CN-ZDL	BHT: 299.6°F MF Sal: 49490 ppm. RM: 0.09ohm-m @ 72°F RMF: 0.07 ohm-m @ 72°F RMC: 0.12 ohm-m @ 72°F
15	8 ½" & 12 ¼"	30.10.2011	3160-4585	VSP	Zero off set recorded @ 15 m interval with source offset at 35 m due N 132°
16	8 ½"	30.10.2011-31.10.2011	4137.5-4124	RCI	18 pressure tests. 5 sample tests were planned but couldn't be carried out due to tight formation.
17	8 ½"	03.11.2011	4667.2-4568.5	SP-DLL-MLL-DAL-CAL	BHT: 291°F MF Sal: 49800 ppm. RM: 0.09ohm-m @ 70°F RMF:0.07ohm-m @ 70°F RMC:0.13 ohm-m @ 70°F
18	8 ½"	03.11.2011	4670.6-4568.5	GR-CAL-CN-ZDL	BHT: 305°F MF Sal: 49800 ppm. RM: 0.09ohm-m @ 70°F RMF:0.07ohm-m @ 70°F RMC:0.13 ohm-m @ 70°F

19	8 ½”	06.11.2011-07.11.2011	--	MRX	Tool got held up @ 4573m. Log not accepted
20	8 ½”	07.11.2011	4200-4100	CMR	Recorded from 4200– 4100m and station log @ 4129m, 4125m and 4118m BHT: 310°F MF Sal: 49000 ppm. RM: 0.09 ohm-m @ 70°F RMF:0.07 ohm-m @ 71°F RMC:0.13 ohm-m @ 71°F
21	8 ½”	10.11.2011	4170-4030	STAR-DCBIL	Lower intervals were not recorded due to hole stickiness.
22	8 ½”	10.11.2011-11.11.2011	4067-4670	SWC	7 Rotary cores attempted, none accepted. 25 side wall cores attempted, 3 accepted
23	6”	02.12.2011	4671.8-4730.49	)AL- DLL-MLL-GR- CAL -SP	BHT: 332.2 °F MF Sal: 47000 ppm. RM: 0.112ohm-m @ 89.3°F RMF:0.100ohm-m @ 89.3°F RMC:0.134 ohm-m @ 89.3°F
24	6”	02.12.2011	4671.8-4718.91	CN-ZDN-GR	BHT: 335.9°F MF Sal: 47000 ppm. RM: 0.112ohm-m @ 89.3°F RMF:0.100ohm-m @ 89.3°F RMC:0.134 ohm-m @ 89.3°F
25	6”	18.12.2011	4671.8-4876.99	AL-DLL-MLL-CAL-GR	Run#1. DLL Tool malfunctioned. BHT: 321.5°F MF Sal: 52000ppm. RM: 0.0989ohm-m @ 80.3°F RMF:0.0873ohm-m @ 80.3°F RMC:0.315 ohm-m @ 80.3°F
26	6”	18.12.2011	4671.8-4877.18	CN-ZDN-GR	BHT: 326.03°F MF Sal: 52000ppm. RM: 0.0989ohm-m @ 80.3°F RMF:0.0873ohm-m @ 80.3°F RMC:0.315 ohm-m @ 80.3°F
27	6”	19.12.2011	4671.8-4872.5	RESISTIVITY	
28	6”	19.12.2011	4855-4460	VSP	Zero off set recorded @ 15 m interval
29	7” csg	22.12.2011	3165-4666	-VDL-GR- CCL	BHT: 307°F
30	5” csg	03.01.2012-04.01.2012	4495-4833.6	-VDL-GR- CCL	BHT: 337.1 °F

C). Well log evaluation and initial test results (GS041NAA-1)

In the discovery well GSS041NAA-1 in the block GS-OSN-2004/1, full set of logging data was acquired. On the basis of the log processing, and the geological information during drilling, reservoir characteristics, five objects were identified for testing of which three objects were tested.

CMR and MR Scanner Logs were also recorded in the interval of 4200-4100m. CMR stations @ 4129.5m, 4125.5m & 4115m were also recorded. VSP was carried out at different stages in the intervals 1800-265m, 3260-1610m, 4585-3260m & 4855-4460m @ 15 m intervals, thus covering the entire drilled section. CBL-VDL-GR-CCL logs were recorded in the intervals of 4666-3165 m in 7" liner & 4834-4495m in 5" liner.

Interpretation of CMR log in the interval 4200-4100 m indicates

- CMR total porosity vary around 0- 16%, CMR effective porosity vary around 0-11% & CMR Free Fluid porosity" vary around 0-6%. This CMR effective porosity also validates the Elan effective porosity. T2 cut off used is 33ms. Computed Timur/Coates permeability is 2 mD which is indicative of poor permeability and tight formation in the interval 4114-4134m and the permeability is nil for the rest of the section ie., 4134-4200 m.
- Interpretation of CMR station reading @ 4129.5m shows that the reservoir is probably water saturated at this depth, Sxo=89% & total porosity=15.2%. CMR station reading @ 4115m shows that the reservoir is mostly water saturated at this depth, Sxo=86% & total porosity=9.6%. However, CMR station reading @ 4125.5m indicates gas saturation at this depth, Sxo=89.2% & total porosity=6.5%.

Brief testing results are presented in Table 4-57.

Table 4-57: GS041NAA-1 test results summary, Object-I, IV and V

Object/Interval (m)	Formation	Choke (inch)	Q_{gas} (m^3/day)	FTHP (psi)	Remarks
Obj. I 4795.5-4784.5	Mesozoic / Sandstone	¼	40606	1080	--
		3/8	35250	450	Volume of water not measurable
		½	35166	250	--
		½	35597	250	After 24 hr. build up
Testing of Obj. II and Obj. III was cancelled.					
Obj. IV. 4172.0-4170.0 & 4139.0-4112.5	Mesozoic / Sandstone	3/8	Not Measurable	35	Volume of gas not measurable
Obj IV. 4138.5-4135.0 & 4125.0-4112.5	Mesozoic / Sandstone	Obj-IV was reperforated at the selected interval. On testing, the object continued to knock out diesel @ FTHP 12 psi through ¼" choke. Testing was called off and on reverse-out, contaminated mud with gas and then water of constant salinity 33000 ppm. as NaCl were collected.			
Obj. V. 4072.35-4058.0	Trap/Basalt	¼	3348	100	--

Figure 4-76: Log Motif Object-I (GSS041NAA-1)

Figure-7a

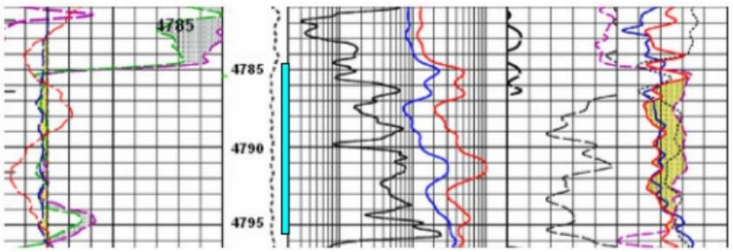


Figure 7a-i: LOG MOTIF OF OBJ-I (4795.5-4784.5 m, MESOZOIC)

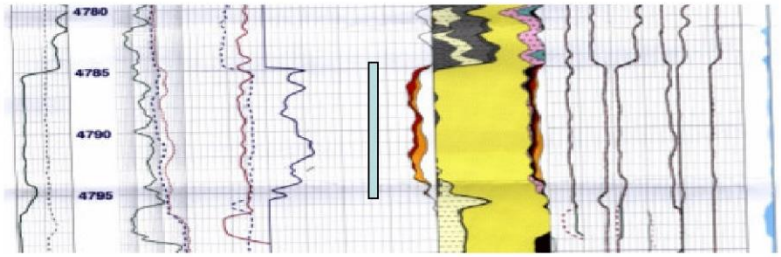


Figure 7a-ii: ELAN OF OBJ-I (4795.5-4784.5 m, MESOZOIC)

Choke (")	O_{oil} (BOPD)	Q_{gas} (m^3/day)	Q_{cond} (BPD)	Q_{water} (BPD)	FTHP (psi)	FTHT (°F)	Salinity (ppm as NaCl)	API (°)	Remarks
¼	--	40606	--	--	1080	85	--	--	--
3/8	--	35250	--	Not measurable	450	90	824	--	Volume of water not measurable
½	--	35166	--	12	250	90	330	--	--
½	--	35597	--	12	250	90	36900	--	After 24 hr. build up

Figure 4-77: Log Motif of Object-IV (GSS041NAA-1)

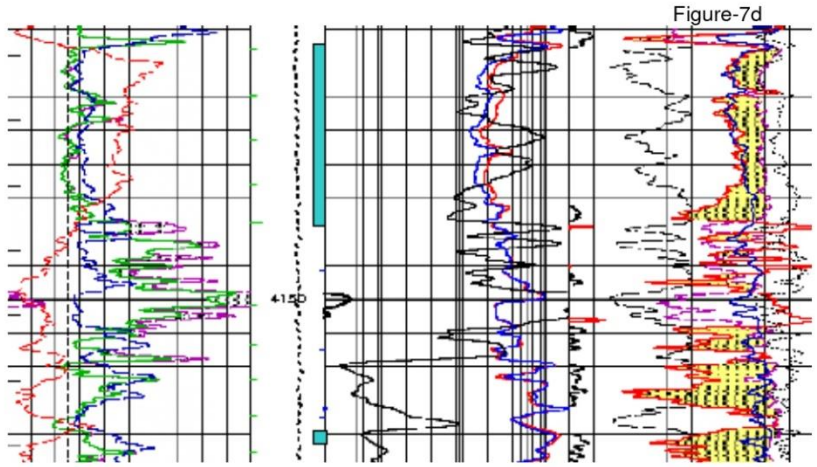


Figure 7d-i: LOG MOTIF OF OBJ-IV (4172-4170 m, 4139-4112.5 m. MESOZOIC)

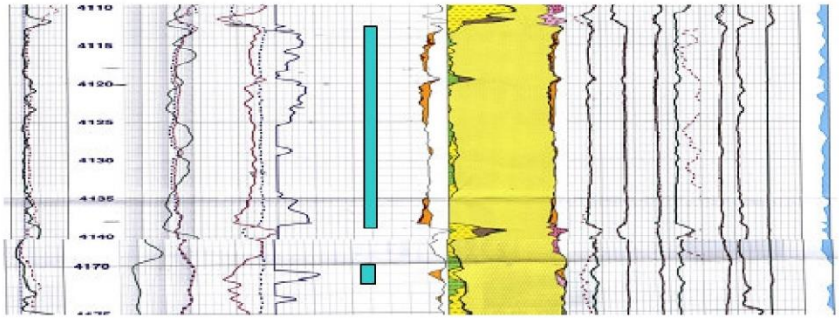


Figure 7d-ii: ELAN OF OBJ- IV (4172-4170 m, 4139-4112.5 m. MESOZOIC)

Choke (")	O_{oil} (BOPD)	Q_{gas} (m^3/day)	Q_{cond} (BPD)	Q_{water} (BPD)	FTHP (psi)	FTHT (°F)	Salinity (ppm as NaCl)	API (°)	Remarks
3/8	--	Not Measurable	--	--	35	80	--	--	Volume of gas not measurable
On reverse-out, found little gas and formation water, salinity ranging from 29800 to 650 ppm as NaCl, and mud contaminated with water.									

Figure 4-78: Log Motif of Object-IV (GSS041NAA-1) - Re-test

Figure-7e

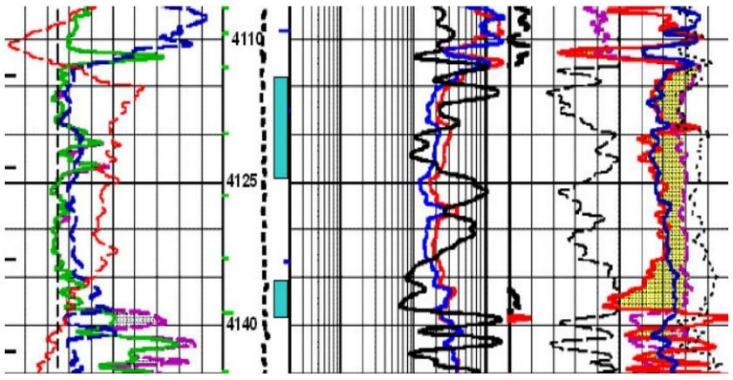


Figure 7e-i: LOG MOTIF OF OBJ-IV (4172-4170 m, 4139-4112.5 m. MESOZOIC)

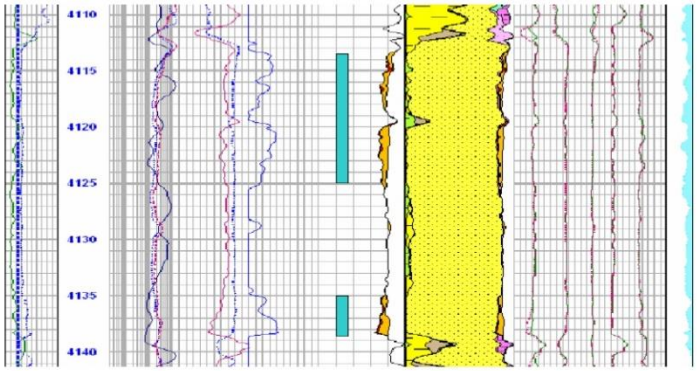


Figure 7e-ii: ELAN OF OBJ- IV RETEST (4138.5-4135 m, 4125-4113.5 m. MESOZOIC)

Obj-IV was reperforated at the selected interval. On testing, the object continued to knock out diesel @ FTHP 12 psi through ¼" choke. Testing was called off and on reverse-out, contaminated mud with gas and then water of constant salinity 33000 ppm. as NaCl were collected.

Figure 4-79: Log Motif of Object-V (GSS041NAA-1)

Figure-7f

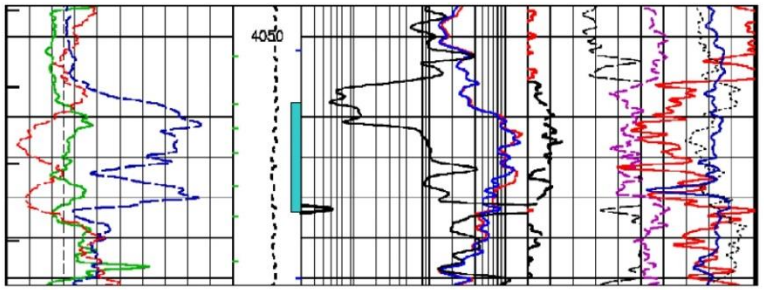


Figure 7f: LOG MOTIF OF OBJ-V (4072-4058 m, WEATHERED TRAP)

Choke (")	O_{oil} (BOPD)	Q_{gas} (m^3/day)	Q_{cond} (BPD)	Q_{water} (BPD)	FTHP (psi)	FTHT (°F)	Salinity (ppm as NaCl)	API (°)	Remarks
¼	--	3348	Not Measurable	--	100	75	--	--	

4.6.3 Well testing and workover history

In the well GSS041NAA-1, based on log characteristics and hydrocarbon show detected during drilling, three objects were tested

Object- I (4795.5-4784.5m), Mesozoic / Sandstone

Testing results of Object-I are presented in Table 4-58.

Table 4-58: GSS041NAA-1 well test results, Object-I

Bean Size (inch)	Gas Rate, m3/day	Water (BPD)	FTHP (psi)	FTHT (°C)
¼	40606	--	1080	85
3/8	35250	Not measurable (Sal: 824 ppm as NaCl)	450	90
½	35166	12 BPD (Sal: 330 ppm as NaCl)	250	90
½ (After build-up studies)	35597	12 BPD (Sal: 36900 ppm as NaCl)	250	90

Object-II & III were cancelled

Object- IV (4172.0-4170.0 & 4139.0-4112.5m)

The well was tested twice. On testing, the object continued to knock out diesel @ FTHP 12 psi through ¼" choke. Testing was called off and on reverse-out, contaminated mud with gas and then water of constant salinity 33000 ppm as NaCl were collected.

Object-V (4072.35- 4058.0m), Trap/Basement

Well test results for Object-V are presented in Table 4-59.

Table 4-59: GSS041NAA-1 well test results, Object-V

Bean size (inch)	Gas m^3/d	Cond (BPD)	Oil (BPD)	Water (BPD)	FTHP (psi)	FTHT (°C)
¼"	3348	--	--	--	105-110	70

4.6.4 Reservoir engineering studies and analysis

Key reservoir engineering datasets, wherever available, have been collated and presented under various data genres. In a comprehensive data presentation, the results are included from well tests, formation dynamics tests, reservoir pressure build-up study and PVT data/ results.

4.6.4.1 Formation dynamics tests (GSS041NAA-1)

RCI was carried out in 12 ¼ and 8 ½ hole (Table 4-60).

Table 4-60: GSS041NAA-1 RCI summary

Hole Size (in)	Pressure Test		Sample Test	Remarks
12 ¼" (Pilot Hole)	Attempted	48	Out of 10 samples attempted, only 9 could be collected. Samples attempted from 1423-1427 m were either tight or lost-seal.	RCI pretest was attempted at 10 points in the first run but was later rejected because the pressures were fluctuating at every point.
	Good	23		
	Tight Seal	14		
	Lost Seal	11		
8 ½"	Attempted	18	Five RCI sample intervals were planned. However, samples could not be collected due to tight nature of formation/no-seal. Hence, further RCI sampling was called off.	
	Good	0		
	Tight Seal	12		
	Lost Seal	0		
	No Seal	6		

RCI Pretest in 12 ¼" Pilot Hole

RCI pretest in 12 ¼ pilot hole details are presented in Table 4-61.

Table 4-61: GSS041NAA-1 RCI Pretest in 12 ¼" Pilot Hole

Test no	Depth (m)	Mud pressure (psi)		Formation Pressure (psi)	Drawdown Mobility (md/cp)	Remarks
		Before	After			
1	548.13	993.93	993.26	787.946	60.5	Good / 2nd run
2	543.53	985.95	984.29	781.222	673.1	Good/ 2nd run
3	554.01	1003.40	1001.79	796.143	240.6	Good/ 2nd run
4	558.81	1003.40	1011.35	803.591	365.3	Good/ 2nd run
5	597.50	1084.48	1083.64	858.809	32.9	Good/ 2nd run
6	599.50	1087.17	1085.90	861.902	616.2	Good/ 2nd run
7	605.21	1098.25	1095.31	870.252	2.5	Good/ 2nd run
8	610.20	1106.90	1105.45	877.660	50.0	Good/ 2nd run
9	620.51	1125.27	1121.45	--	--	No seal/ 2nd run
10	700.00	1266.66	1260.02	--	--	No seal/ 2nd run
11	700.50	1269.50	1263.36	1011.745	151.8	Good/ 2nd run
12	704.00	1275.85	1274.00	1016.881	39.6	Good/ 2nd run
13	710.52	1287.67	1280.71	1026.614	48.7	Good/ 2nd run
14	740.51	1342.62	1339.65	1074.635	2.8	Good/ 2nd run
15	771.00	1396.77	1396.45	--	--	Tight/ 2nd run

16	774.91	1402.18	1400.97	1120.057	9.3	Good/ 2nd run
17	823.50	1513.89	1509.50	1200.08	15.8	Good/ 2nd run
18	548.00	991.58	985.01	787.213	164.6	Good / 3rd run
19	599.50	1080.87	1081	--	--	Tight/ 3rd run
20	599.00	1079.37	1077.1	--	--	Tight/ 3rd run
21	605.90	1092.39	1089.29	--	--	No seal/ 3rd run
22	607.20	1094.19	1093.39	--	--	No seal/ 3rd run
23	620.50	1118.34	1118.70	--	--	Tight/ 3rd run
24	700.50	1263.04	1261.69	--	--	Tight/ 3rd run
25	699.01	1259.14	1256.55	--	--	No seal/ 3rd run
26	704.00	1267.83	1262.87	1016.728	558.3	Good/ 3rd run
27	740.51	1333.94	1333.00			Lost seal/ 3rd run
28	739.04	1334.73	1329.81	1067.154	84.3	Good/ 3rd run
29	771.50	1391.37	1389.73	1116.072	291.4	Good/ 3rd run
30	832.51	1501.37	1499.61	--	--	Tight/ 3rd run
31	834.00	1503.82	1491.10	--	--	Lost seal/ 3rd run
32	833.00	1503.58	1496.98	--	--	Lost seal/ 3rd run
33	833.50	1502.52	1497.63	--	--	Tight/ 3rd run
34	858.00	1547.18	1547.28	--	--	Tight/ 3rd run
35	857.80	1548.39	1543.09	--	--	Tight/ 3rd run
36	859.06	1545.78	1545.00	1243.918	2711.5	Good/ 3rd run
37	1067.96	1924.18	1920.60	--	--	Tight/ 3rd run
38	1069.00	1922.45	1922.35	1547.328	29.8	Good/ 3rd run
39	1081.00	1949.20	1948.00	1570.671	8.9	Good /4th run
40	1329.01	2379.22	2375.75	--	--	Tight/4th run
41	1328.49	2381.01	2373.88	1927.609	12.7	Good/4th run
42	1423.01	2544.06	2544.18	--	--	Tight/4th run
43	1424.00	2545.29	2544.74	--	--	No seal/4th run
44	1425.00	2547.49	2546.27	--	--	No seal/4th run
45	1426.50	2549.81	2549.07	--	--	Tight/4th run
46	1427.00	2550.01	2549.00	--	--	No seal/4th run
47	1426.00	2548.68	2547.86	--	--	Tight/4th run
48	619.42	1111.68	1110.26	891.020	1141.8	Good/4th run

RCI Pretest in 8 ½" Pilot Hole

RCI pretest in 8 ½ pilot hole details are presented in Table 4-62.

Table 4-62: GSS041NAA-1 RCI Pretest in 8 ½" Pilot Hole

Test no	Depth (m)	Mud Pressure (psi)		Formation Pressure (psi)	Drawdown Mobility (md/cp)	Temp (°F)	Remarks
		Before	After				
1	4137.99	8347.60	8348.00	--	--	283.6	No Seal
2	4137.54	8345.50	8345.80	--	--	286.0	No Seal
3	4137.03	8344.00	8344.20	--	--	287.3	No Seal
4	4136.49	8319.48	8329.25	--	--	284.2	No Seal
5	4136.05	8331.35	8330.90	--	--	289.0	Tight
6	4134.98	8321.69	8322.35	--	--	290	Tight
7	4133.99	8318.76	8319.55	--	--	290.3	Tight

8	4133.02	8315.20	8315.33	--	--	290.6	No seal
9	4132.02	8311.39	8311.03	--	--	290.9	Tight
10	4131.05	8307.67	8308.10	--	--	291.2	Tight
11	4130.04	8304.59	8305.59	--	--	291.3	Tight
12	4129.01	8301.70	8301.60	--	--	291.4	Tight
13	4128.03	8298.16	8298.16	--	--	291.6	Tight
14	4127.04	8294.18	8293.68	--	--	291.7	Tight
15	4126.05	8290.88	8290.73	--	--	291.7	Tight
16	4125.09	8288.02	8287.75	--	--	291.8	Tight
17	4124.04	8284.28	8284.39	--	--	291.9	Tight
18	4123.01	8280.61	8269.00	--	--	292.1	No seal

4.6.4.2 Pressure Build up study

Pressure transient study has been done in Object-I for which salient results are presented in Figure 4-80 and Figure 4-81.

Figure 4-80: GSS041NAA-1 DST Pressure Build-up Plot (Obj-I)

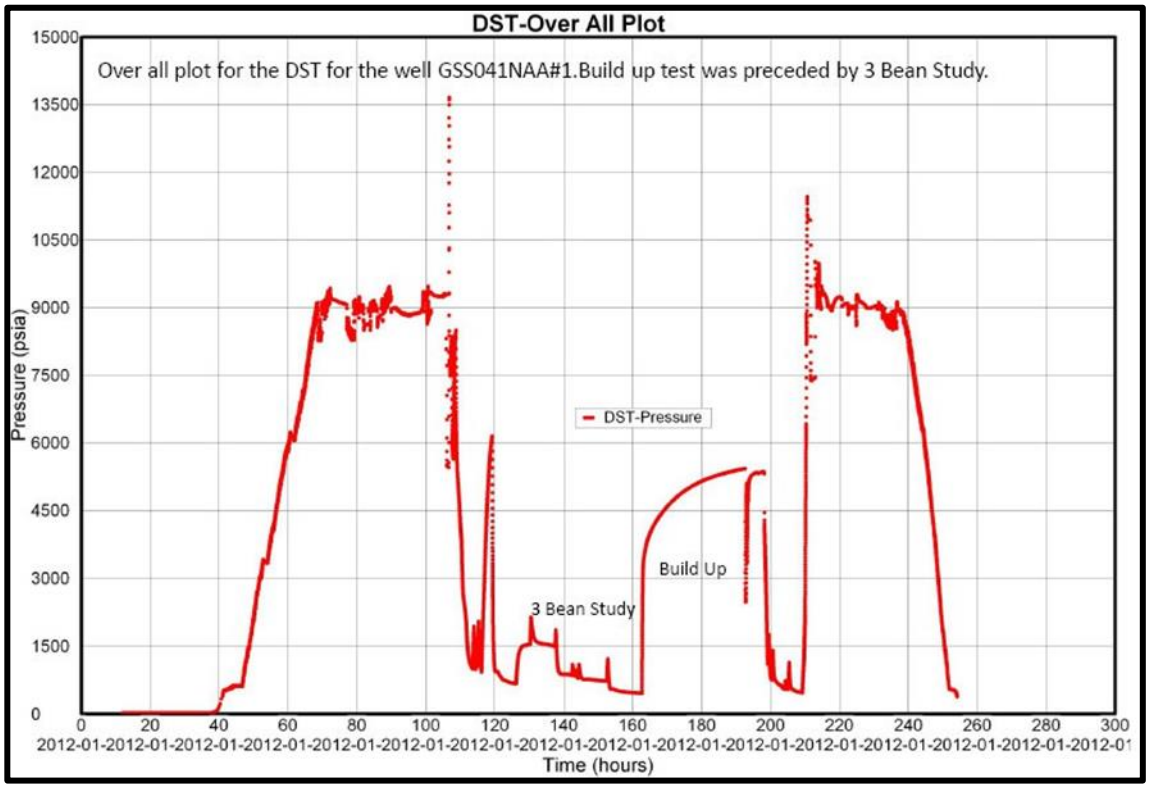
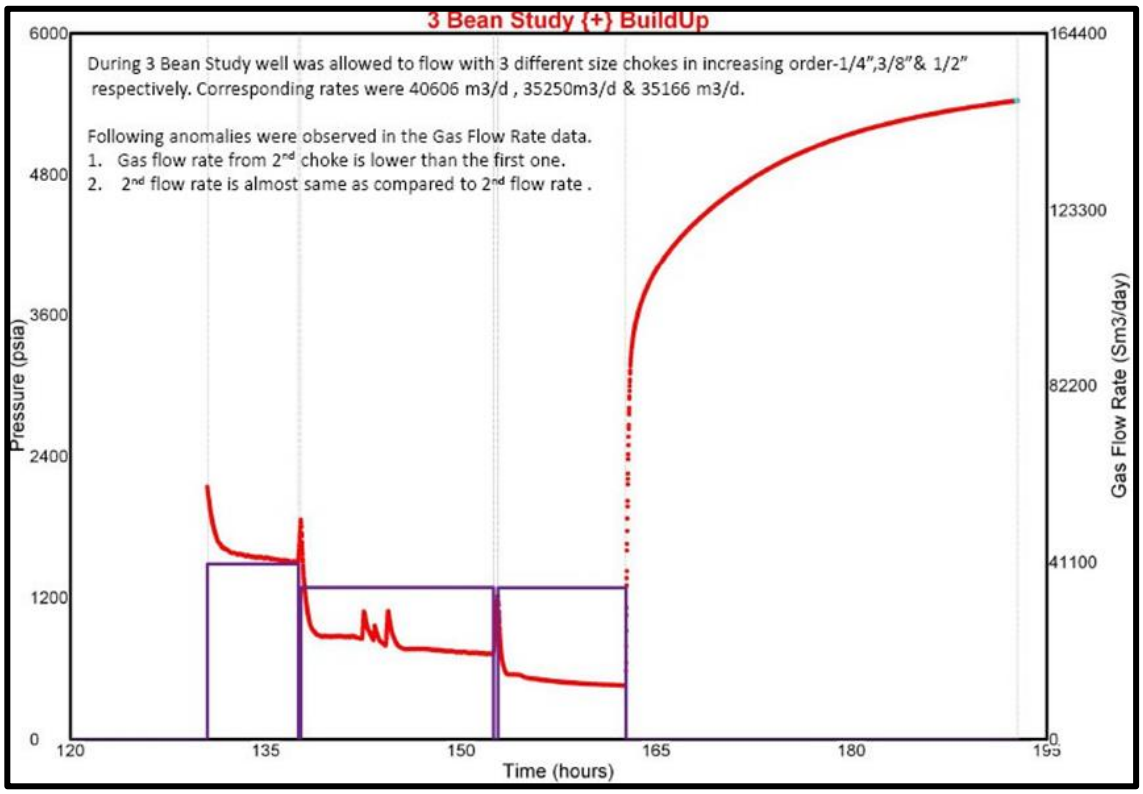


Figure 4-81: GSS041NAA-1 DST Bean Study (Obj-I)



Main results of Object-I are as below:

- AOFP could not be ascertained as the rates measured were not correct.
- Permeability and skin estimates are approximate. Order of magnitude of permeability is quite low 0.1 – 0.2md
- The presence of multiple boundaries.

4.6.4.3 Gas composition analysis (GS041NAA-1)

Gas composition results of Object-I are presented in Table 4-63.

Table 4-63: GSS041NAA-1 Gas composition

Sample No.	Choke (")	Source	Date	Time Hrs.	TG (%)	C_1 (%)	C_2 (%)	C_3 (%)	iC_4 (%)
1	¼	Niddle valve	13.01.12	1100	79.6	62.99	7.065	0.184	--
2		Separator		1400	80.8	61.279	7.863	1.083	--
3				1600	80.4	60.236	8.079	0.311	--
4				1730	76.72	60.070	5.689	0.134	--
5	3/8	Niddle valve		1900	82.74	60.936	8.974	1.081	--
6				2100	84.70	62.512	8.691	1.230	--
7				2300	83.47	61.913	7.492	1.852	--
8				0100	82.80	61.021	7.266	1.817	--
9				0300	83.90	61.825	7.921	1.769	--
10				0500	84.49	62.108	8.212	1.509	--

11		Separator		0700	82.47	60.139	8.056	1.542	--
12				0900	83.54	61.727	7.915	1.727	--
13		Niddle valve		1100	84.37	61.892	8.204	1.062	--
14			14.01.12	1300	85.93	63.122	8.710	1.176	--
15	½			1500	85.71	62.833	9.109	1.351	--
16		Separator		1700	82.83	60.773	7.927	1.096	--
17				1900	80.21	59.721	7.724	1.081	--
18				0800	81.14	60.51	8.05	1.145	--
19	½ after B/up studies	Niddle valve		1000	82.72	61.191	8.127	1.053	--
20			16.01.12	1200	85.53	61.164	9.847	1.344	--
21		Separator		1400	82.93	60.554	8.166	0.916	--
22				1600	81.69	60.801	7.725	1.471	--

4.6.5 Geology and Reservoir Description of GSS041NAA-1

The geology of the area has been comprehensively reviewed using correlations, sections and maps. The well correlation, seismic sections, top structure, seismic attribute/amplitude and net sand/pay maps have been used to illustrate the magnitude and distribution of key reservoir properties in and around the discovered oil/gas pools (accumulations). The local tectonic setting and geological section of the area, wherever available are also given. These maps/sections are sequentially shown field-wise and reservoir unit-wise through figures, appropriately titled and illustrated in the following section.

Geological correlations, sections and maps (GSS041NAA-1)

GSS041NAA-1, was drilled to explore the hydrocarbon potential of Mesozoic sequence and Tertiary sediments.

The structure is a fault closure with a fault to the east having an axial trend roughly in NNW-SSE direction and is bounded by a big low in the south. In the north, a structural nose protrudes and runs further north, bounded by N-S trending inversion faults on either side. The well GSS041NAA-1 (refer to Figure 4-84) was drilled down to 4887 m as against the target depth of 5267m (revised) to explore the hydrocarbon potential of Mesozoic and Tertiary sediments. All formations ranging in age from Jurassic (as per laboratory report) to Recent except Cretaceous were encountered in this well. This is the first well in the area which has penetrated 775 m thick sediments of Jurassic age after drilling more than 2400 m of basalt. The well has come up shallower than prognosis at all levels except at Mesozoic section (Figure 4-85 and Figure 4-86) which appeared 1145 m deeper, affirming that the Deccan Trap is actually thicker than prognosed. The nearby wells SOE-2 and SOE-3 which were drilled upto Tertiary level and the present well is correlatable with them (Figure 4-82). It has come shallower with respect to SOE-2 and deeper with respect to SOE-3.

A total of five objects were identified out of which 3 were tested and Object-I on testing produced gas. Two discoveries (GSS041NAA-1 & GSS041NAA-2, refer to Figure 4-82) have been made in the Block GS-OSN-2004/1.

Figure 4-82: Correlation between GSS041NAA-1 and GSS041NAA-2

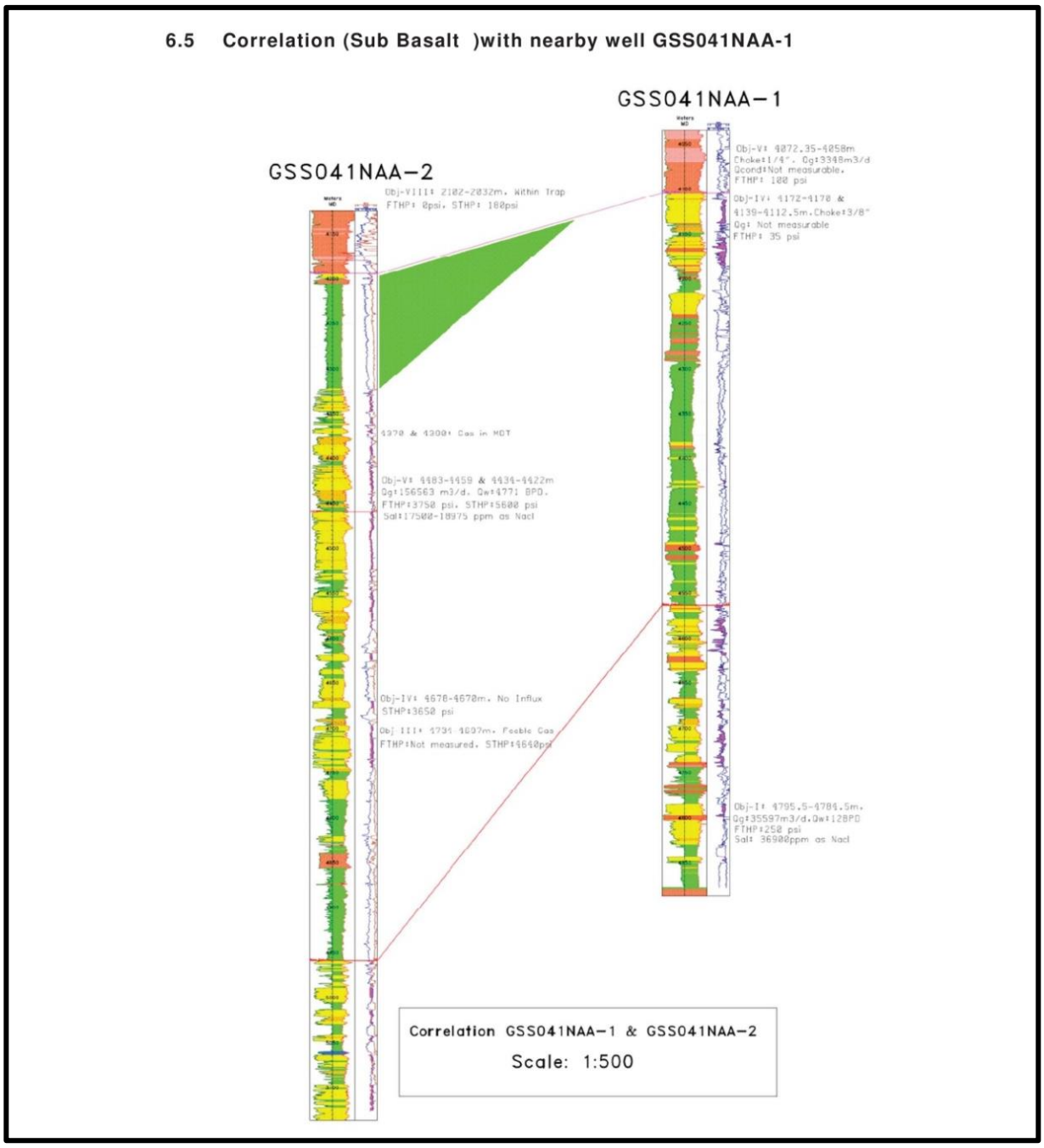


Figure 4-83: Correlation and Test summary for GSS041NAA-1 and GSS041NAA-2

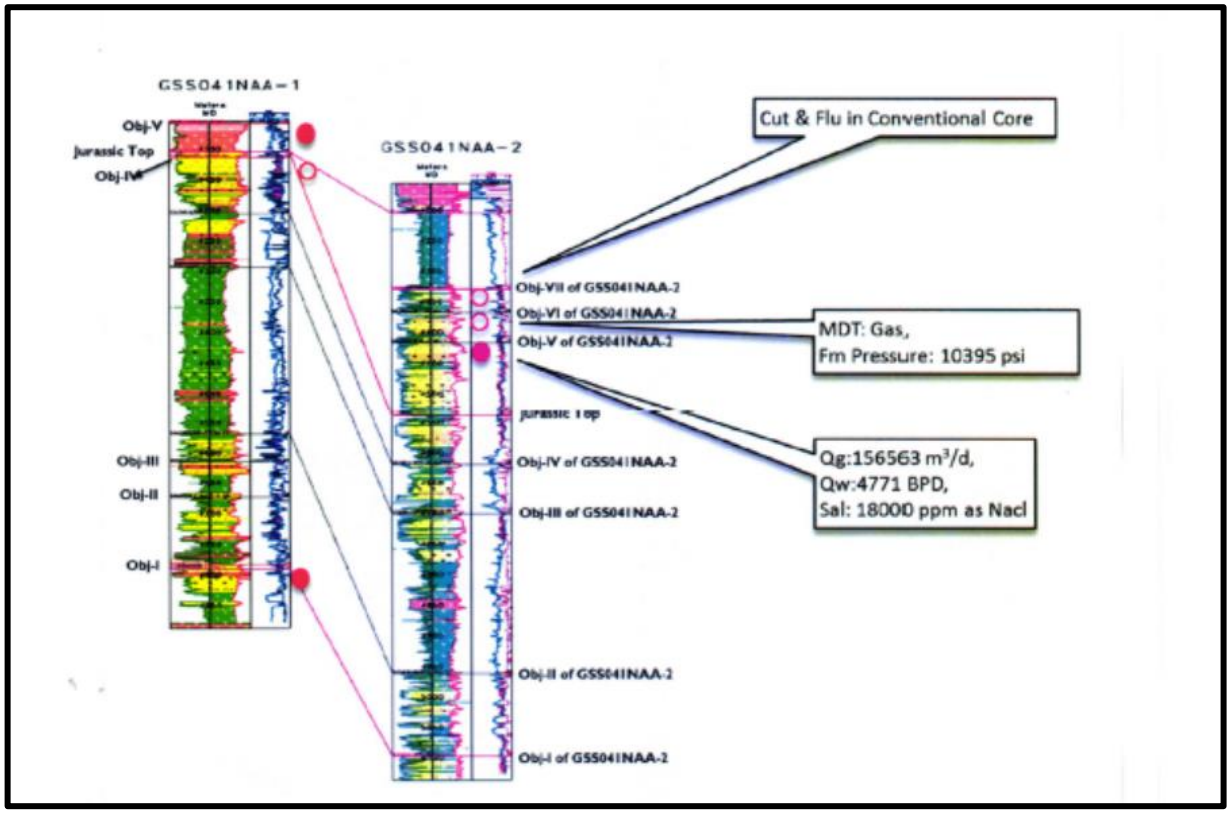
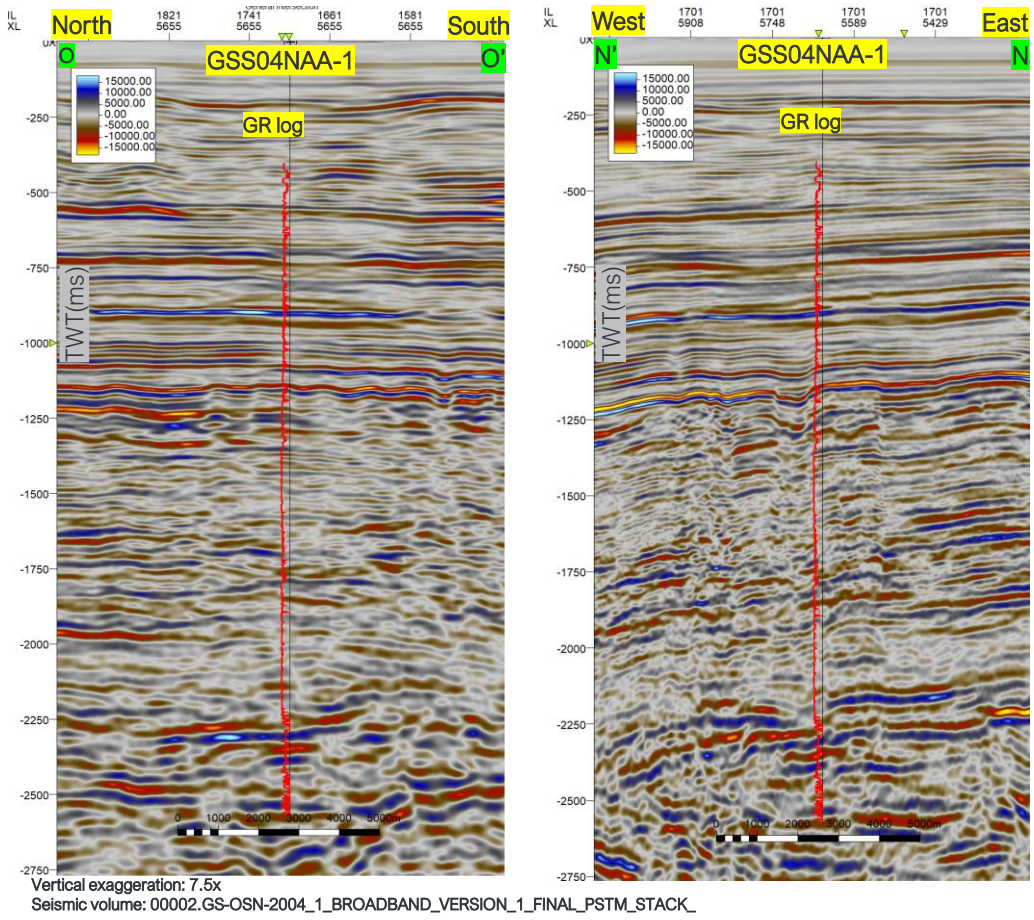
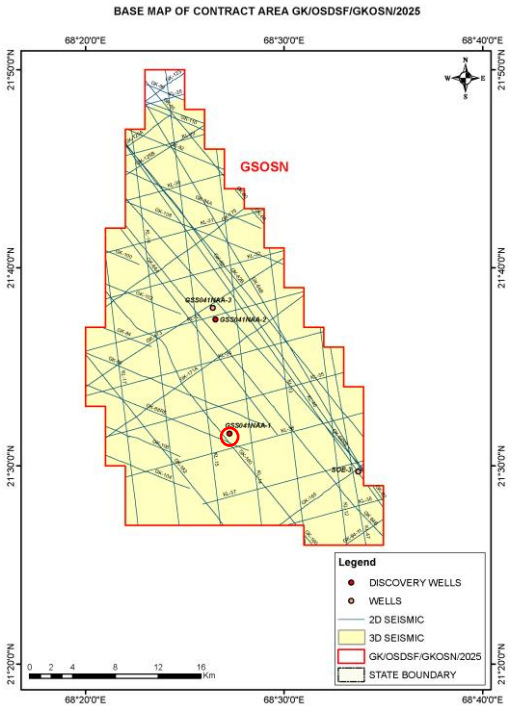


Figure 4-84: Seismic cross-sections passing though GSS041NAA-1



Vertical exaggeration: 7.5x
Seismic volume: 00002.GS-OSN-2004_1_BROADBAND_VERSION_1_FINAL_PSTM_STACK_



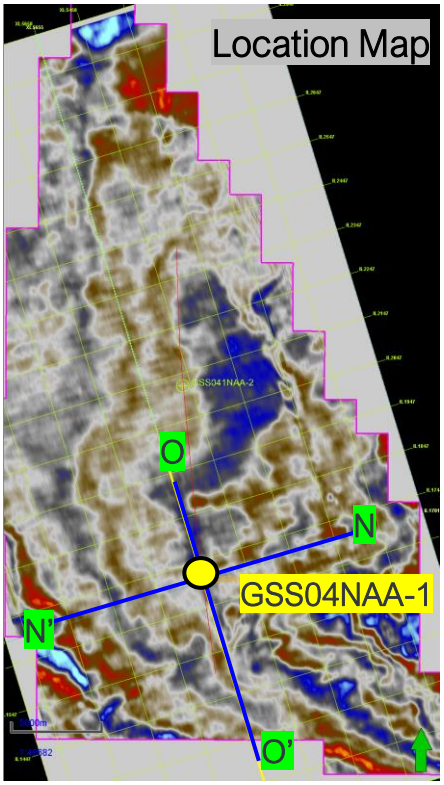


Figure 4-85: Structure map at Top Pay of Object-I - GSS041NAA-1

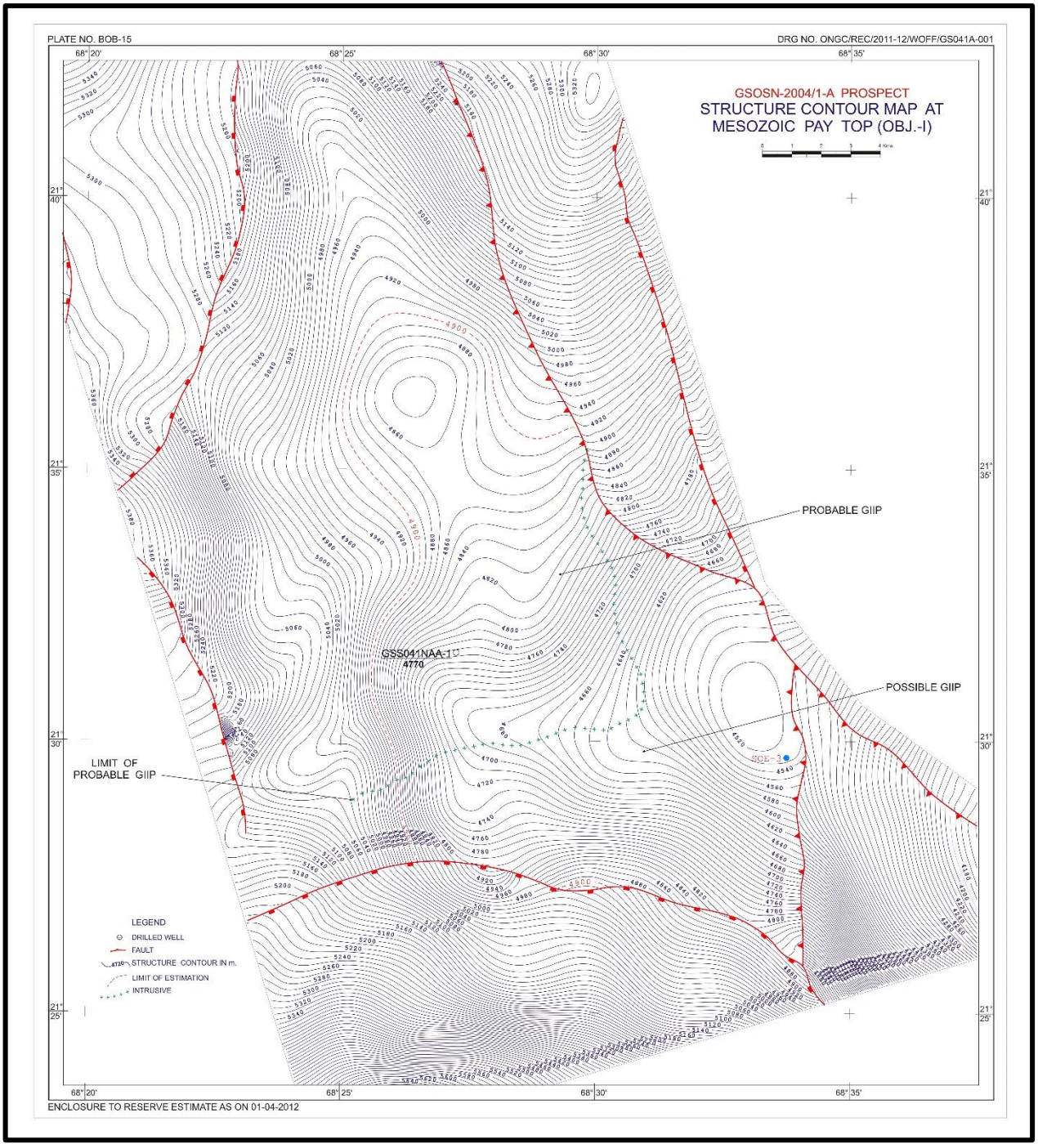


Figure 4-86: ISO Poro, He, Sg map at Top of Object-I - GSS041NAA-1

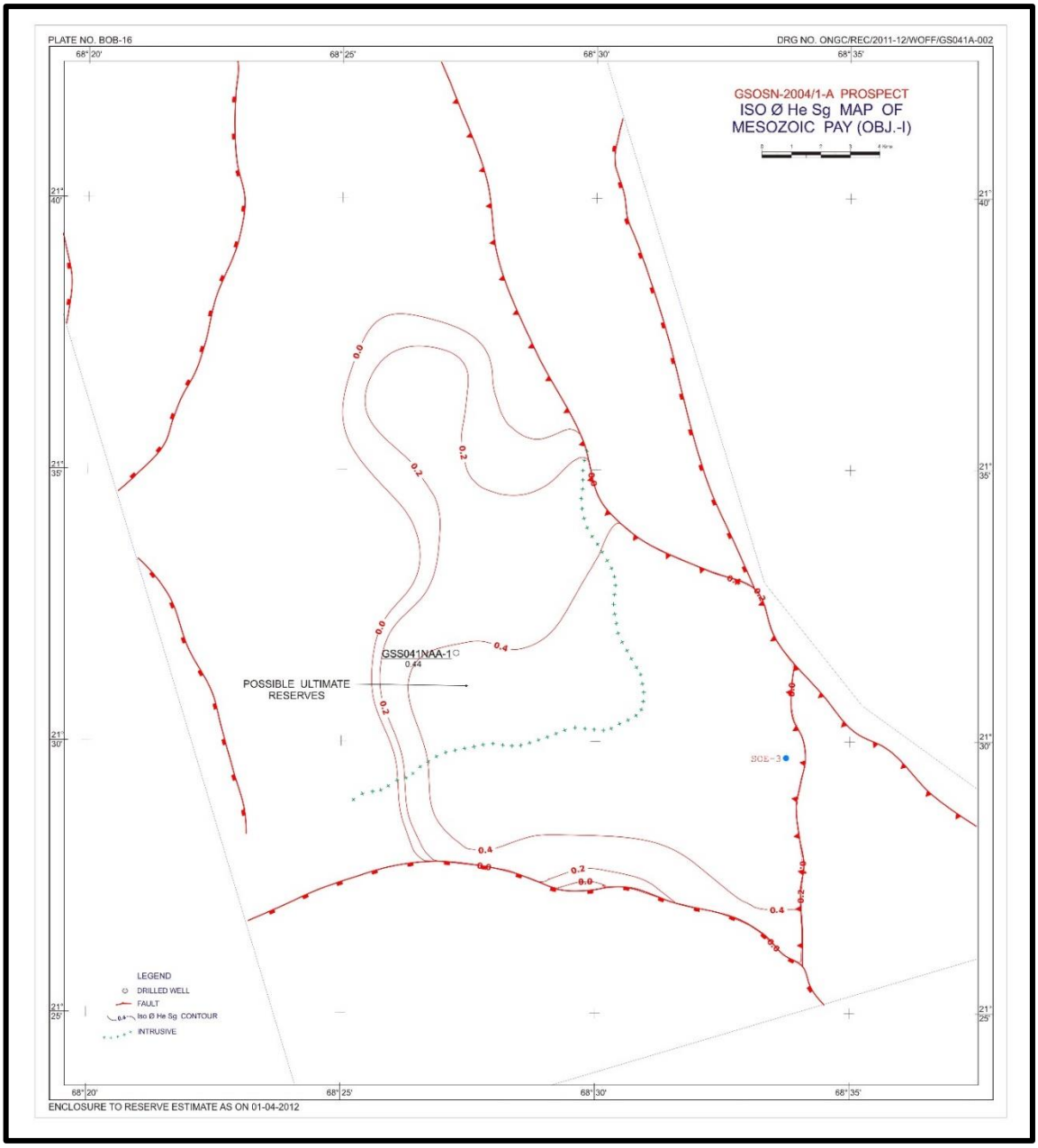


Figure 4-87: Structure map at Top Pay of Object-V, GKS041NAA-1

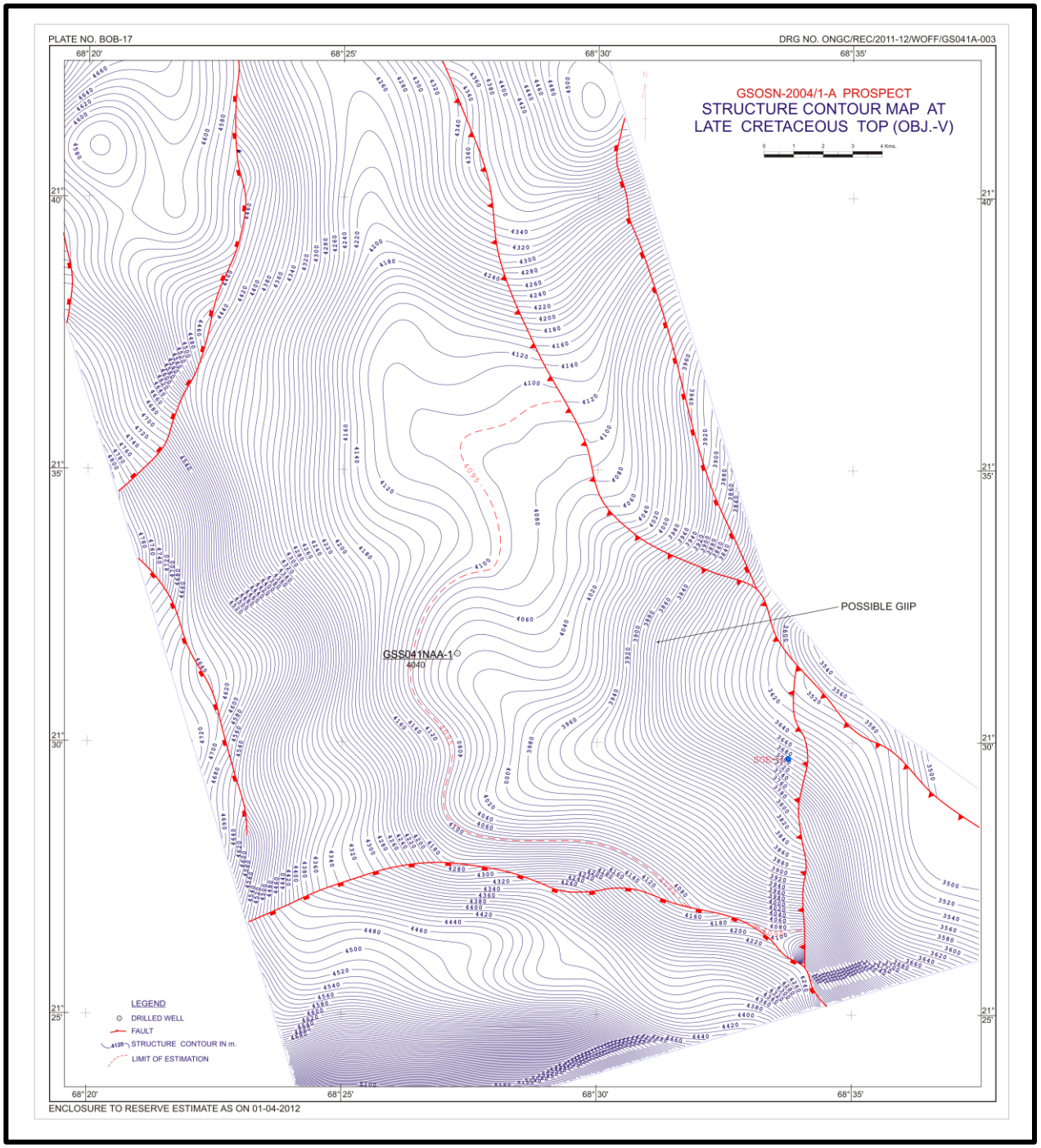
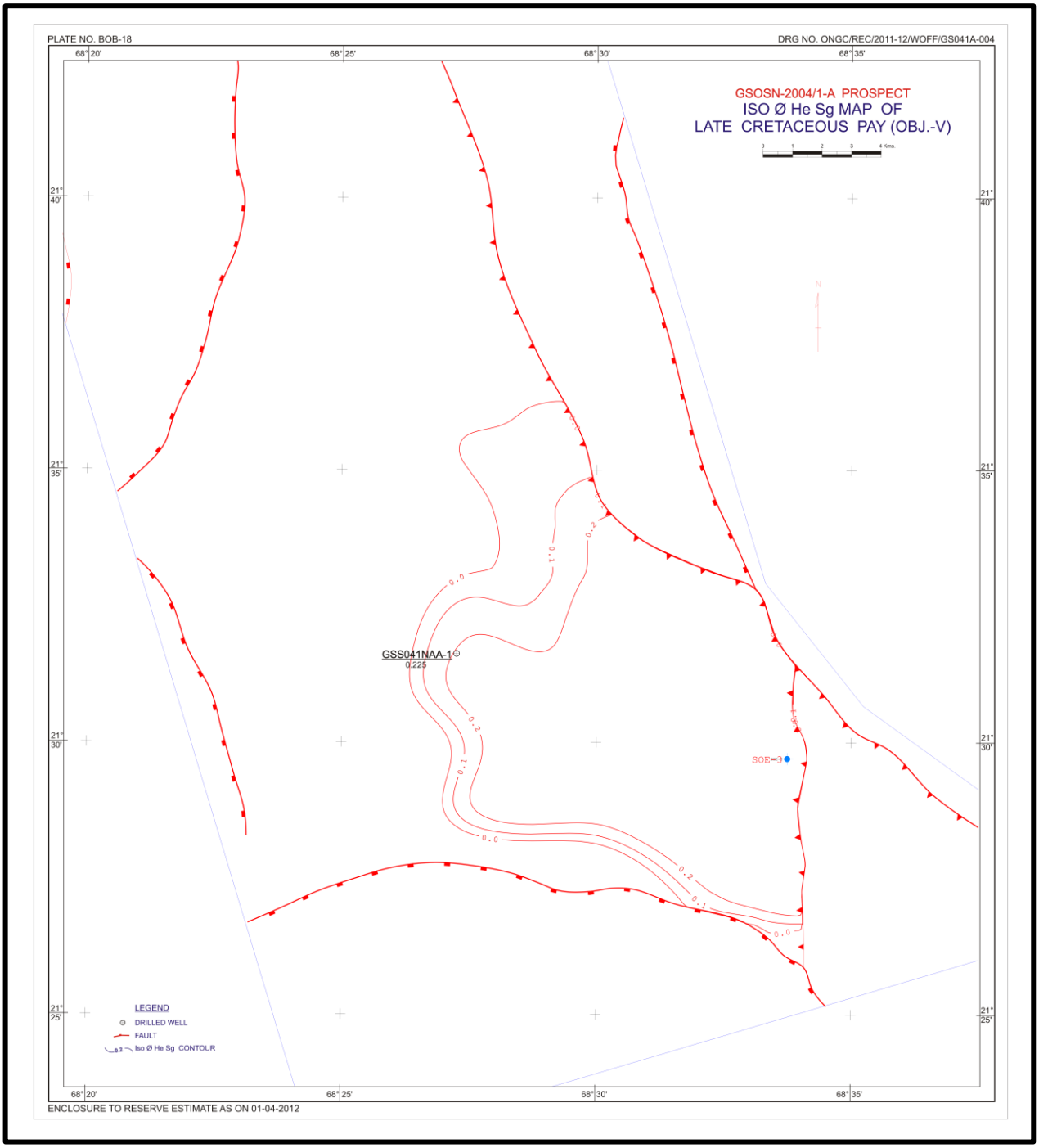


Figure 4-88: ISO Poro, He, Sg map for Object-V, GKS041NAA-1



4.6.6 Reservoir parameters and hydrocarbon estimates (GS041NAA-1)

The estimates of hydrocarbon in-place have been worked out under various field assumptions. All inputs, working and results, as available are presented in the following section (Table 4-64). Structure, Iso pay and Product maps (Φ, He, Sg) of Middle Miocene pay (Object-I) in well GKS101NCA-1 has been prepared (Figure 4-85 and Figure 4-86).

Table 4-64: GSS041NAA-1 – Key volumetric parameters

Discovery	Reservoir	Area	He	Phi	Hydrocarbon Saturation	FVF
	Sand/ layer	SqKM	m	%	Sg	Bg
GSS041NAA-1	Late Cretaceous (FrBasalt) Obj-V [PS]	n/a	n/a	n/a	n/a	0.00777
GSS041NAA-1	**Mesozoic Obj-I [PB]**	**96.943**	**4.4**	**0.29**	**0.6**	**0.00777**
GSS041NAA-1	Mesozoic Obj-Is [PS]	198.883	4.4	0.29	0.6	0.00777

Table 4-65: GSS041NAA-1 – Total GIIP summary

Discovery	Reservoir	GIIP
	Sand/ layer	BCM
GSS041NAA-1	Late Cretaceous (FrBasalt) Obj-V [PS]	0.0000
GSS041NAA-1	**Mesozoic Obj-I [PB]**	**9.5521**
GSS041NAA-1	Mesozoic Obj-Is [PS]	19.5965
	Total 2P	**9.5521 BCM**

Erstwhile Operator-reported estimates on record:

The GSS041NAA-1 have a reported 2P (PB) gas estimate of **7.882 MMTOE**, considering the breakdown:

- GSS041NAA-1 Late Cretaceous (FrBasalt) Obj-V [PS] 6.462 **MMTOE**
- GSS041NAA-1 Mesozoic Obj-I [PB] 7.882 **MMTOE**
- GSS041NAA-1 Mesozoic Obj-Is [PS] 11.410 **MMTOE**

All these hydrocarbon estimates (Table 4-65) are subject to future assessments based on Operator's own technical insights and additional information/data, which may warrant possible revision of the current.

4.6.7 Production Facility for Oil & Gas Evacuation

Production facilities for Oil & Gas Evacuation are summarized in Table 4-66.

Table 4-66: GSS041NAA-1 Production facility for Oil & Gas Evacuation

Sl No	Discovery Name	Basin	Water Depth (mtr)	Oil/Gas	Initial Testing details Gas Rate	Pay sand	Depth of discovered reservoir (TVDSS)	Near-by surface Facility with distance
1	GK-1 (GKS092NAA-1)	Kutch Shallow Offshore	3.5	Gas	Qg=115168 m3/d through ½" choke		898-902 mtr	Upcoming SunPetro Dwarka Onshore Terminal (GK-28) : 120 KM.Cairn Suvali Plant: 489 KM
2	GKOSN-2009/1-D (GKS091NDA-1)	Kutch Shallow Offshore	18	Gas	1,80,000 m3/d	Jakhau (Jakhau & Early Eocene)	1450m	No Facility exists in the region. Planned for evacuation to Dwarka
3	GKS091NFA-1 (GKS091NFA-1)	Kutch Shallow Offshore	19	Gas	2,36,524 m3/d	Weathered Dolerite (Naliya & Mid Cretaceous)	3770m	No Facility exists in the region (Planned for evacuation to Dwarka)
4	GK-OSN-2010-1-A(GKS101NAA-1)	Kutch Shallow Offshore	16	Gas	45,873 m3/d through 1/2" choke, FTHP 250psi	Jakhau (Jakhau & Early Eocene)	1260m	No Facility exists in the region (Planned for evacuation to Dwarka)
5	GK-OSN-2010-1-C (GKS101NCA-1)	Kutch Shallow Offshore	32	Gas	1,63,000 m3/d	Chhasra FM (Chhasra & Mid Miocene)	880m	No Facility exists in the region (Planned for evacuation to Dwarka)
6	GSOSN-2004/1-A (GSS041NAA-1)	Kutch Shallow Offshore	99	Gas	35,597 m3/d (3/8")	Jhuran & Late Jurassic	4370m	Dwarka-115 KM
7	GSS041NAA-B (GSS041NAA-2)	Kutch Shallow Offshore	92	Gas	1,56,563 m3/d	Bhuj & Early Cretaceous	4370m	Dwarka-115 KM

4.6.8 Status of Additional Wells in the area (Polygon)

. Data of all the wells other than discovery are given at 4.8

4.6.9 Main reports available for discovery well GSS041NAA-1

- Well Completion Report (WCR),
- Formation Evaluation report (FER)
- Reservoir Study Report (included in WCR) - April 2012
- Declaration of discovery (DoC), GK-OSN-2004/1, August 2016
- 3D Seismic interpretation report of GS-OSN-2004/1
- Formation Fluid Analysis

GK/OSDSF/GKOSN/2025 GSS041NAA-2 FIELD

4.7 DESCRIPTION OF SAURASHTRA OFFSHORE GSS041NAA-2 (NELP Block GS-OSN-2004/1)

The well GSS041NAA-2, was drilled with a target depth of 5100 m, with an objective to establish hydrocarbon extension of Mesozoic reservoirs encountered in GSS041NAA-1 at a distance of 11 Km in the NELP Block GS-OSN-2004/1. The well lies in the same fault block of GSS041NAA-1 on an independent structural closure. The well was terminated at 5157m and encountered 1879m of Tertiary, 2280m of Basalt and 908m of Mesozoic. Top of Basalt was encountered at 1940m.

The well was drilled in the NELP Block GS-OSN-2004/1 which is situated south of Block GK-OSN-2010/1 with discoveries GKS101NAA-1 & GKS101NCA-1. Further in the north, blocks GK-OSN-2009/1 & GK-OSN-2009/2 have gas discoveries and GK-28/42 PML area in the North East also have discoveries which are currently under development. Another well GK-22C-1, which is situated further north of GKS091NDA-1 also flowed gas from Early Cretaceous Bhuj Sandstone.

The well GSS041NAA-2 was spudded on 01.06.2015 and drilled down to 5157 m. Total eight objects were identified out of which 4 objects were tested. These two discoveries (GSS041NAA-1 & GSS041NAA-2 in the Block GS-OSN-2004/1) are part of GSOSN Polygon under the current DSF-IV offer.
Another well of this polygon, GSS041NAA-3 also produced gas on testing.

4.7.1 Drilling and Well completion

In the polygon GSOSN, there are four wells in the polygon of which two are gas discoveries GSS041NAA-1 & GSS041NAA-2 and two additional wells i.e. GSS041NAA-3 & SOE-3. Well GSS041NAA-3 also produced gas on testing. Key information of the discovery GSS041NAA-2 has been collated and presented hereunder. This includes the Well Construction Diagram (Figure 4-89) and the Litho-column Information (Figure 4-90). Other well statics like Kelly Bush, reference depth, water depth, drilled and logged depth including well coordinates are made available in Sections through various cross-references.

Figure 4-89: Well Construction GSS041NAA-2

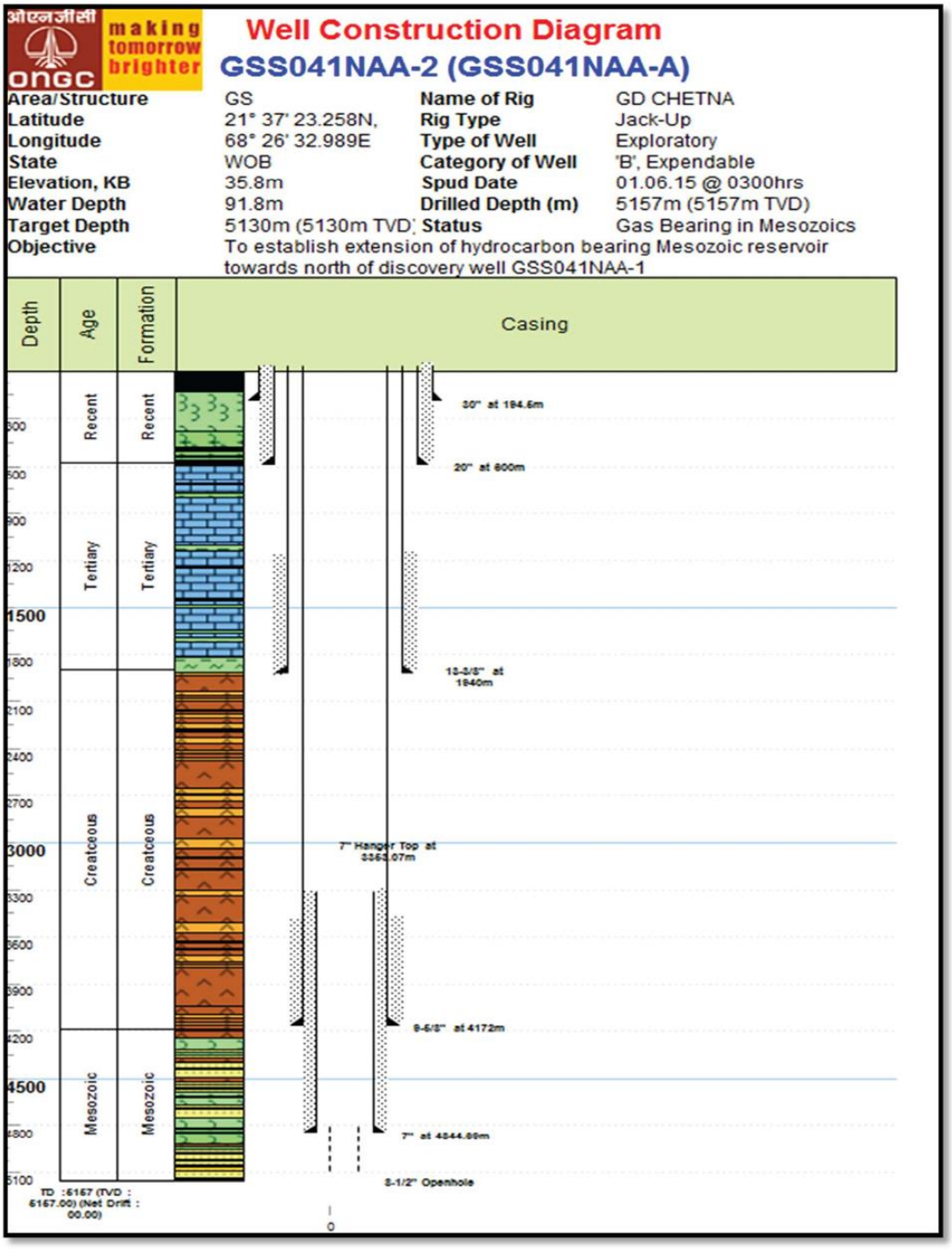
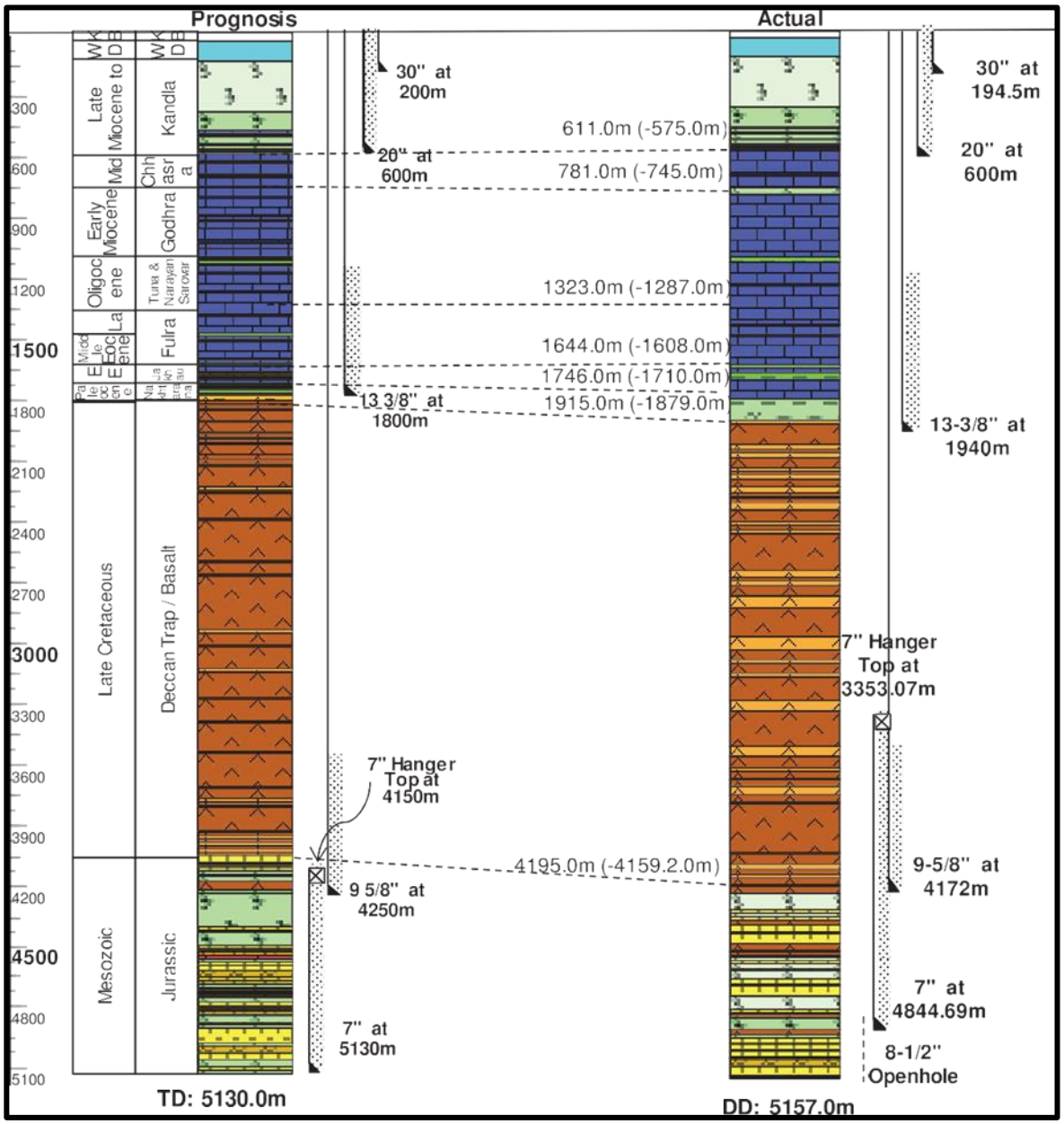


Figure 4-90: Prognosed vs Actual – Stratigraphy (GSS041NAA-2)



4.7.2 Well logging and formation evaluation

The well logs of discovery well GSS041NAA-2 along with some key wells in the contract area have been reviewed. The logs recorded in various open-hole sections along with cased-hole logs and information of conventional and other wireline formation test data are presented in this docket.

The availability of key input reports like Well Completion Reports (WCR), Formation Evaluation Report (FER) and Declaration of Discovery for the Block GS-OSN-2004/1 have been checked and information given. Reservoir parameters of interesting zones and results of the tested zone(s) have been included in this report. Log motifs of tested/ interesting zone of key wells are also appended (Figure 4-91).

A) Well completion and log evaluation reports availability (GSS041NAA-2)

WCR/ FER availability	Spud date	KB	Drilled depth/Water Depth
WCR/FER available	01.06.2015	35.8m	5157 m/91.8

B). Well logs acquired (GSS041NAA-2)

Logs recorded in the well GSS041NAA-2 are as given below:

A). Logging while Drilling

Sl. No.	Hole Size (")	Run	Date	Interval (m)		Data Recorded	Service Provider/ Remarks
				From	To		
1	8 ½	1	07.11.15 to 18.11.15	4141	4728	ARC-ADN- FPWD	Schlumberger/ All tools failed after 4540m.
2	8 ½	2	19.11.15 to 04.12.15	4330	5150	ARC-ADN- FPWD	Schlumberger/ Relogged from 4330m to 4728m. Density tool failed after 4608m
3	8 ½	3	07.12.15 to 09.12.15	4550	5152	ARC-ADN- FPWD	Schlumberger/ Relogged from 4550m to 5150m and drilled down upto 5152m

B). Wireline Logging

Sl. No.	Hole Size (")	Interval (m)		Data Recorded	Service Provider/ Remarks
		From	To		
1	17 ½	1939	599	PEX-HRLA-HNGS	SCHL
2	12 ¼	4166	1939	PEX-HRLA-HNGS	SCHL
3	12 ¼	4165	1938	Sonic Scanner-FMI	SCHL
4	12 ¼	4134.5	3500	CBL-VDL	SCHL

5	8 ½	4490.2	4170	HRLA-PEX-HNGS-GR	SCHL
6	8 ½	-	-	LDT-CNT-GR	Tool held up at 4490m and POOH
9	8 ½	5045	4171	QAIT-QSLT-GR	Observed held up at 5045, Recorded logs from 5045m to 4171m
10	8 ½	4483	4000	FMI-SS-PPC-GR	Observed heldup at 4483m, Recorded logs from 4483m to 4000 m
11	8 ½	-	-	CMR-PPC-GR	Observed heldup at 4178m
12	8 ½"	4338	4390	MDT	Observed H/up at 4390m. Pre tested 6 points (Good-2, Tight-2, Lost seal-2). Took three gas samples.
13	8 ½"	-	-	MSCT	Job was cancelled after rig up and RIH of MSCT tools up to 150m.
14	7" Liner	4784	4474	Sonic Scanner-GR	Observed H/up @ 4794m
15	7" Liner	4785	3356	USIT-CBL-VDL-GR-CCL	Observed H/up @ 4794m
16	7" Liner & 9 ⅝" Csg.	4324	952.4	VSP-GR	
17	7" Liner	4641	4263.7	QAST	Observed H/up @ 4794m

C). Well log evaluation and initial test results (GSS041NAA-2)

In the discovery well GSS041NAA-2 in the block GS-OSN-2004/1, full set of logging data was acquired. On the basis of the log processing, and the geological information during drilling, reservoir characteristics, five objects were identified for testing of which three objects were tested.

Figure 4-91: Log Motif GSS041NAA-2

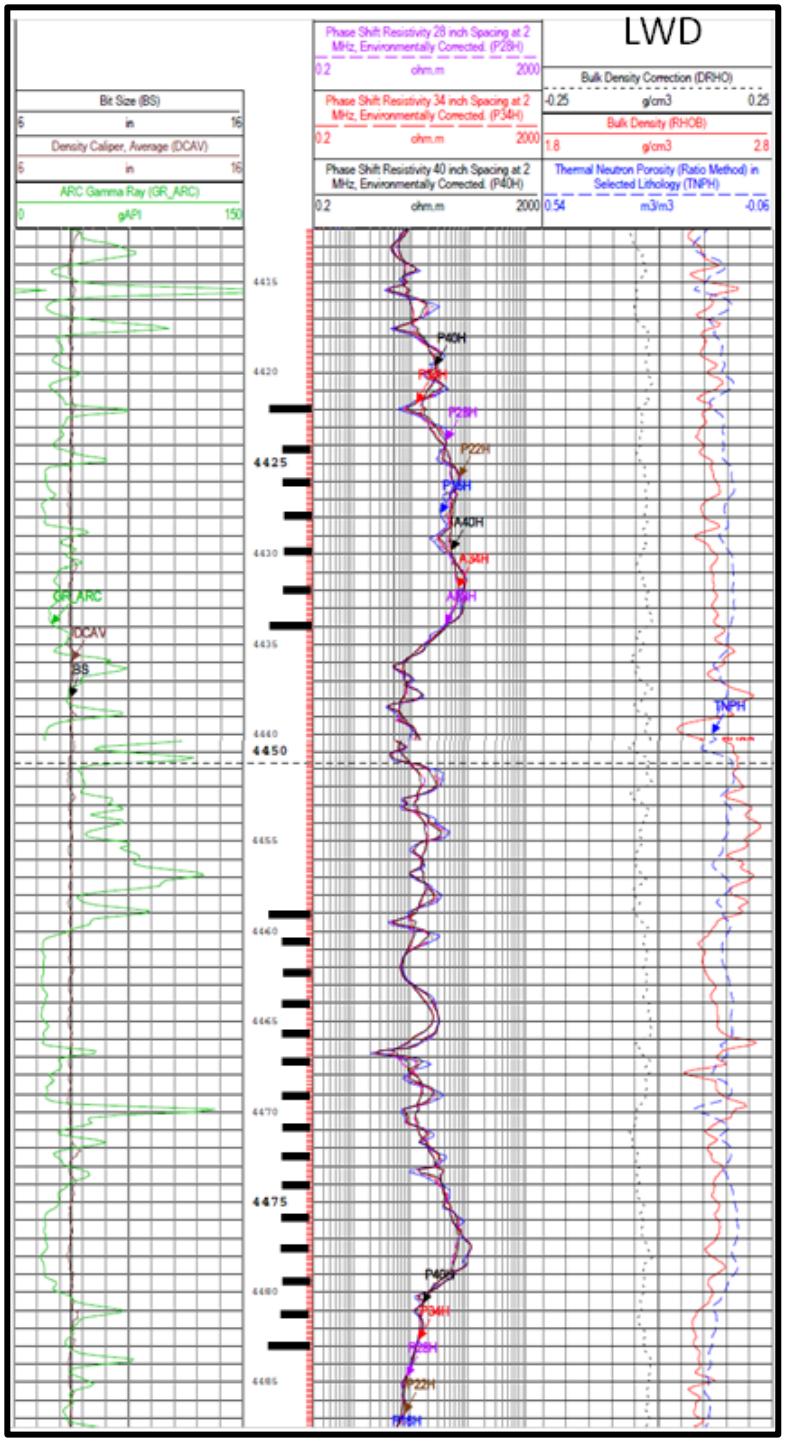


Table 4-67: GSS041NAA-2 – tested reservoir parameters

Interval (KB)	Gross Thickness (m)	Net Pay (m)	Porosity (v/v)	Water saturation (Sw, v/v)	Result
4434-4422	12	8.84	10%	54	Flowed Gas

Brief of testing results are given below

In total, eight objects were identified in this well, out of which Seven Objects (Objects-I to VII) were identified in the Mesozoic section, and one object (Object-VIII) was identified in the upper Trap section (Basalt) for production testing. Objects I, II, VI & VII could not be tested due to technical reasons (refer to Table 4-67 and Table 4-68).

Table 4-68: GSS041NAA-2 – Brief well test summary of the objects tested.

OBJECT	INTERVAL (m)	MODE OF TESTING	STATUS OF OBJECT	REMARKS
III	4734-4697	TCP DST	DRY	
IV	4678- 4670m	Wire-line perforation + DST	DRY	
V	4483-4459m 4434-4422m	TCP DST	Gas and water bearing	Choke-32/64", FTHP-3750Psi, FTHT-112 °C, Qgas: 1,56,563 m3/day, Qw-4771 bbl/d, STHP- 7100Psi.
VIII	2102-2032 m	TCP DST	DRY	

4.7.3 Well testing and workover history

In the well GSS041NAA-2, based on log characteristics and hydrocarbon show detected during drilling, three objects were tested

Object-III (4734-4697mm), Mesozoic

Well did not produce any hydrocarbons after retesting.

Object-IV (4678-4670m), Mesozoic

Well did not show any activity

Object-V(4483-4459m & 4434-4422m), Mesozoic

The details of the test are presented in Table 4-69.

Table 4-69: GSS041NAA-2 – well test details, Object-V

Choke size	Qw	Qg	FTHP	FTHT	STHP	Sal	Remark
(")	BPD	m3/d	psi	° C	psi	ppm as NaC	
½	4771	156563	3750	112		17500	
					5600		Surface BUP for 9 hrs.
1/8	494	14442	5300	52		18900	
1/4	2208	38734	4800	75		18000	
3/8	4368	89239	4200	96		18975	
1/2			3400	114			Rate could not be estimated due to separator.
					7100		Surface BUP
1/4	1740	46307	4800	62		18150	

Object-VIII (2102-2132m), Basalt

Well did not flow. BHT-192oF

4.7.4 Reservoir engineering studies and analysis

Key reservoir engineering datasets, wherever available, have been collated and presented under various data genres. In a comprehensive data presentation, the results are included from well tests, formation dynamics tests, reservoir pressure build-up study and PVT data/ results.

4.7.4.1 Formation dynamics tests (GSS041NAA-2)

LWD Stethoscope Tool was lowered in this well in 8 ½" section. Pre-tests were first carried out by the LWD Stethoscope Tool in two runs. In 3rd run, with Wire Line, MDT Tool was lowered for pre-tests as well as for Formation Fluid Samples collection. MDT Fluid samples were planned for six intervals in Mesozoic Sandstones above 4490m. Intervals below 4490m were not attempted as there were held ups observed in all the previous runs of wire line at around 4490m. MDT Saturn tool also got held up at 4391m. Two MDT Fluid Samples were collected from two different depths @ 4390.0m (two Samples from this depth) & @ 4370.0m (one sample from this depth). Both these Samples yielded gas.

Run-1 - LWD Stethoscope Pre-tests

LWD Stethoscope pre-tests were completed, and Run-1 data is presented in Table 4-70.

Table 4-70: GSS041NAA-2 – LWD Stethoscope Pre-tests – Run-1

MD (m)	Mud Hyd. Pressure (psi)		Formation Pressure (psi)/MWE in ppg	Drawdown Pressure (psi)	Drawdown Mobility (md/cp)	Remarks
	Before	After				
4366.99	11315	11316	-	-	-	Tight
4364.99	11303	11310	11282.2 (15.14 ppg)	10657	**0.34**	Good (Low confidence Press,)
4365.49	11306	11302	11284.0 (15.14 ppg)	10082	**1.23**	Good (Low confidence Press,)
4357.50	11288	11290	-	5241	-	Tight
4386.01	11353	11357	**10398 (14.00 ppg)**	10227	**12**	Good (High Confidence)
4391.50	11375	11387	-	5398	-	Tight
4391.00	11379	11374	10700.0 (14.27 ppg)	8301	**0.65**	Good (low confidence Pressure)

Run-2- LWD Stethoscope Pre-tests

LWD Stethoscope pre-tests were completed, and Run-2 data is presented in Table 4-71.

Table 4-71: GSS041NAA-2 – LWD Stethoscope Pre-tests – Run-2

Test No.	MD (m)	Mud Hyd. Pressure (psi)		Formation Pressure (psi)	Drawdown Pressure (psi)	Drawdown Mobility (md/cp)	Remarks
		Before	After				
1	5095.25	13718	13748	-	7867	-	Tight
2	5093.51	13707	13693	-		-	No Seal
3	5094.99	13656	13679	-	7722	-	Tight
4	5069.30	13628	13631	-	7630	-	Tight
5	5074.80	13641		-		-	Tight
6	5074.80	13640	13646	-	7685	-	Tight
7	5064.30	13623	13605	-	7687	-	Tight
8	5057.30	13611	13617	-		-	No Seal
9	4956.00	13340	13340	-	7753	-	Tight
10	4956.50	13343	1339	-	7420	-	Tight
11	4957.00	13342	13350	-	9809	-	Tight
12	4957.00	13347	13343	-		-	No Seal
13	4957.50	13350	13352	-		-	No Seal

Run-3- MDT pre-tests

MDT pre-tests were completed, and Run-3 data is presented in Table 4-72.

Table 4-72: GSS041NAA-2 – MDT Pre-tests – Run-3

MD (m)	Mud Hyd. Pressure (psi)		Formation Pressure (psi)	Draw down Pressure (psi)	Drawdown Mobility (md/cp)	Remarks
	Before	After				
4370.0	11239.34	11191.51	10939.1 (14.66 ppg)	8100	0.04	Low confidence pressure. Highly supercharged

						.
4390.0	11246.6	11210.47	10395 (13.87 ppg)	10305	10.13	Gas Sample taken in MRSC and MPSR
4342.6	11111.46	11106.79	-	-	-	
4342.0	11103.93	11098.26	-	-	-	
4339.0	11090.85	11094.52	-	-	-	
4338.6	11099.61	11098.31	-		-	

MDT Formation Pressure is presented in Table 4-73.

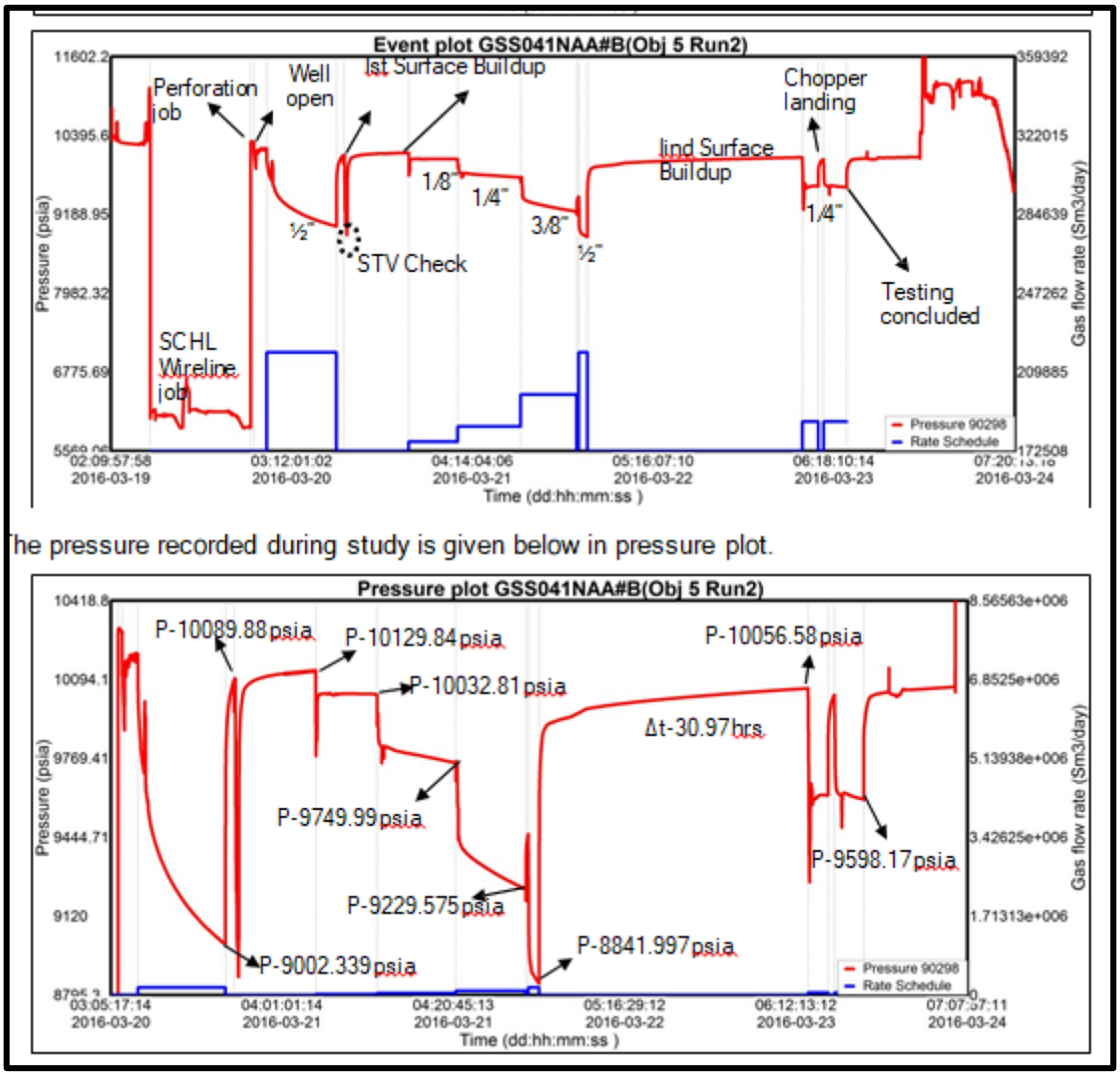
Table 4-73: GSS041NAA-2 – MDT Formation Pressure summary

MD (m)	Mud Hyd. Pressure (psi)		Formation Pressure (psi)	Draw down Pressure (psi)	Temp (°F)	Drawdown Mobility (md/cp)	Remarks
	Before	After					
4370.0	11239.34	11191.51	10939.1 (14.66 ppg)	8100	309.79	0.04	Low confidence pressure. Highly supercharged. Gas Sample taken in MRSC from saturn probe.
4390.0	11246.6	11210.47	10395 (13.87 ppg)	10305	312.16	10.13	Gas Sample taken in MRSC and MPSR

4.7.4.2 Pressure Build Up study

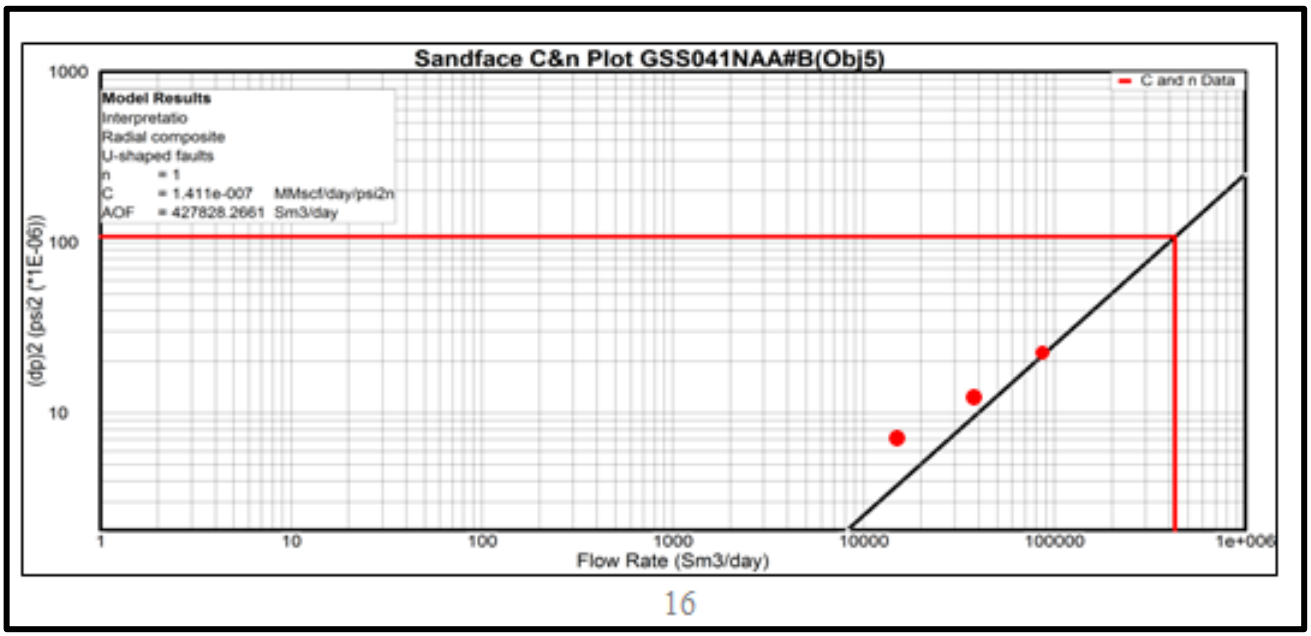
Pressure transient studies have been carried out and presented in Figure 4-92 and Figure 4-93.

Figure 4-92: GSS041NAA-2 Pressure Build-up Plot (Obj-V, Run-2)



The pressure recorded during study is given below in pressure plot.

Figure 4-93: GSS041NAA-2 Sandface C&n Plot (Obj-V)



Results of Pressure transient studies in Object-V are presented in Table 4-74.

Table 4-74: GSS041NAA-2 – Pressure Build-up interpretation parameters, Object-V

Parameter	Result
Wellbore storage coefficient (bbl/psi)	0.0029
Permeability (md)	0.923
Skin factor	(-ve)0.235
Permeability 2nd zone (md)	2.694
Permeability 3rd zone (md)	0.10
Simulated reservoir pressure(psia)	10283.57
AOFP, m3/day	427828

4.7.4.3 Gas composition analysis (GSS041NAA-2)

Gas composition results of Object-V are presented in Table 4-75.

Table 4-75: GSS041NAA-2 – Gas composition, Object-V

Table1: Gas Analysis Report

TEST REPORT NO.	032-OT-2016	DATE	26/05/2016
WELL No.	GSS041NAA-2	RIG	G D Chetana

Sample details

OBJECT	V	
DEPTH(m)	4483-4459,4434-4422	
DATE OF COLLECTION	20.03.2016	21.03.2016
CHOKE SIZE	3/8"	3/8"
TIME	07:45	21:45
FTHP(PSI)	5700	4200
DATE OF RECEIPT IN LAB	16.05.2016	
LAB SL. No.	092-OT-2016	093-OT-2016

Results

CONSTITUENT	VOLUME %	VOLUME %
METHANE	87.53	83.88
ETHANE	1.73	1.63
PROPANE	0.23	0.19
ISO-BUTANE	0.08	0.07
N-BUTANE	0.05	0.03
ISO-PENTANE	0.03	0.02
N-PENTANE	0.02	0.01
HEXANE	0.10	0.12
NITROGEN	1.34	1.53
CARBON DI OXIDE	8.89	12.49
HELIUM(ppm)	BDL	BDL
H2S(ppm)	BDL	BDL
MOL. WT.	19.15	20.14
SP. GRAVITY	0.6624	0.6969
NET CALORIFIC VALUE (KCAL/M^3)	7503	7180
GROSS CALORIFIC VALUE (KCAL/M^3)	8325	7967

WO/ RGL/CH/ISO/REC/ GAF1

Remark:

BDL below detection limit of the instrument.

4.7.5 Geology and Reservoir Description of GSS041NAA-2

The geology of the area has been comprehensively reviewed using correlations, sections and maps. . The local tectonic setting and geological section of the area, wherever available are also given. These maps/sections are sequentially shown field-wise and reservoir unit-wise through figures, appropriately titled and illustrated in the following section.

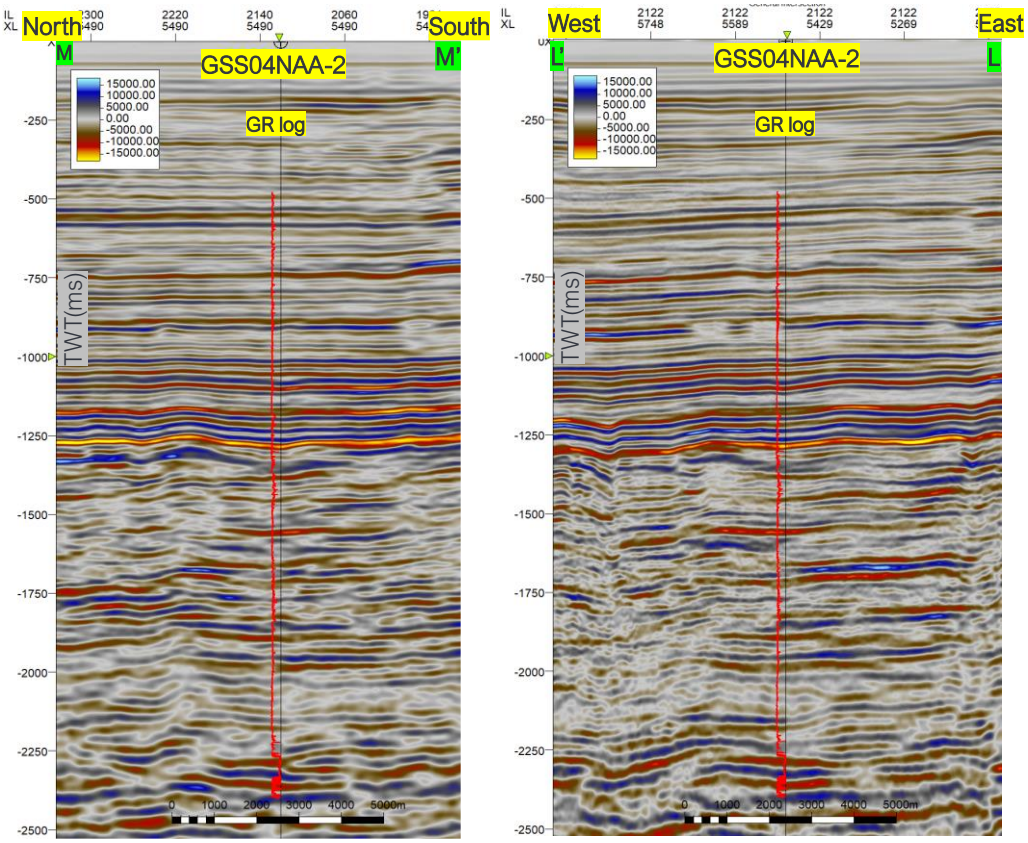
Geological correlations, sections and maps (GSS041NAA-2)

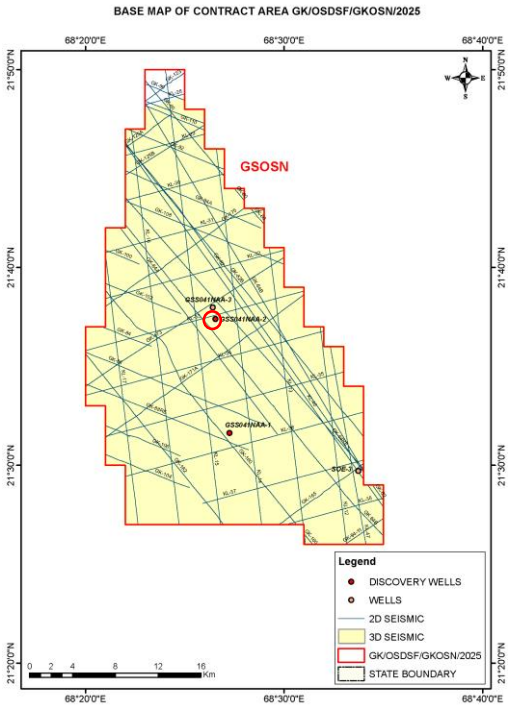
The well GSS041NAA-2 (refer to Figure 4-94), was drilled with a target depth of 5100 m, with an objective to establish hydrocarbon extension of Mesozoic reservoirs encountered in GSS041NAA-1 at a distance of 11 Km in the Block GS-OSN-2004/1. The well lies in the same fault block of GSS041NAA-1 on an independent structural closure. The well was terminated at 5157m and encountered 1879m of Tertiary, 2280m of Basalt and 908m of Mesozoic (refer to Figure 4-96 - Figure 4-98). Top of Basalt was encountered at 1940m.

The well GSS041NAA-2 was spudded on 01.06.2015 and drilled down to 5157 m. Total eight objects were identified out of which 4 objects were tested. These two discoveries (GSS041NAA-1 & GSS041NAA-2 in the Block GS-OSN-2004/1) are part of GSOSN Polygon under the current DSF-IV offer.

A total of eight objects were identified out of which 4 were tested and Object-V on testing produced gas. Two discoveries (GSS041NAA-1 & GSS041NAA-2, refer to Figure 4-95) have been made in the Block GS-OSN-2004/1.

Figure 4-94: Seismic cross-sections passing through well GSS041NAA-2





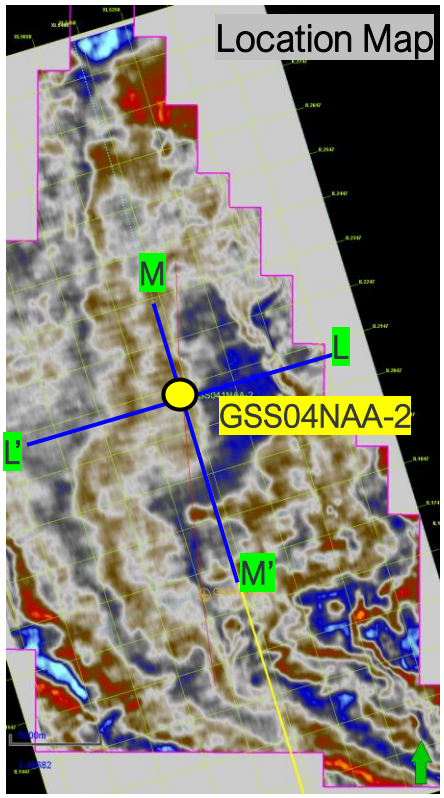


Figure 4-95: Correlation between GSS041NAA-2 and GSS041NAA-1

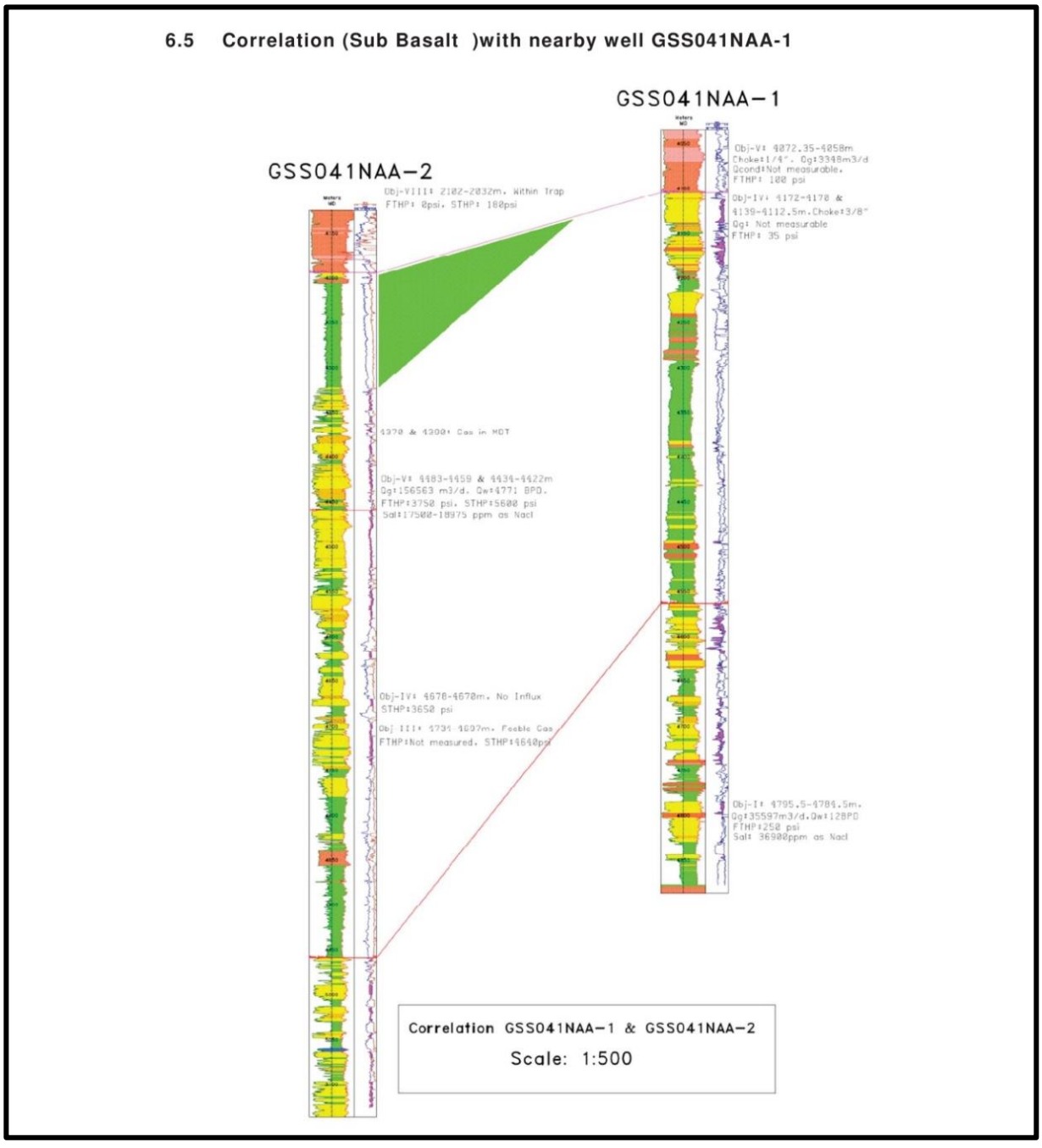


Figure 4-96: Structure Map Top of Object-V GSS041NAA-2

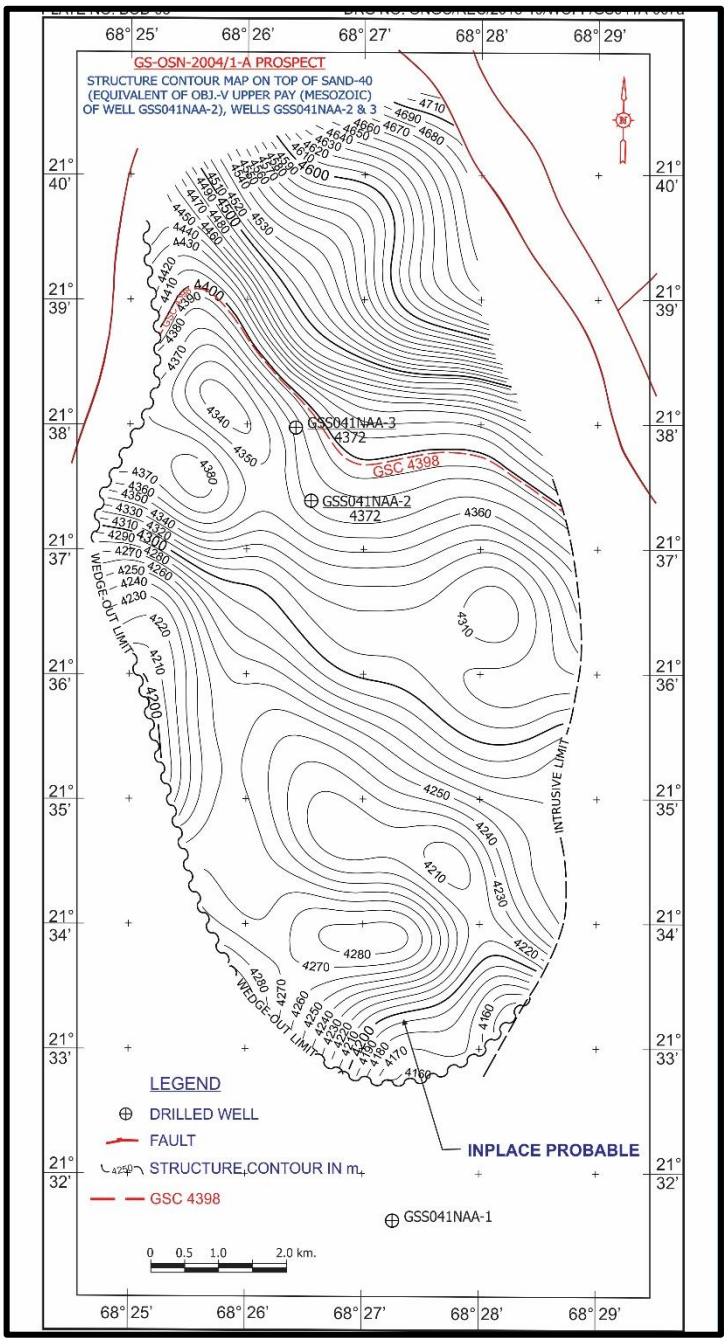


Figure 4-97: ISO Gas Pay Map, Top of Object-V GSS041NAA-2 (Sand-40)

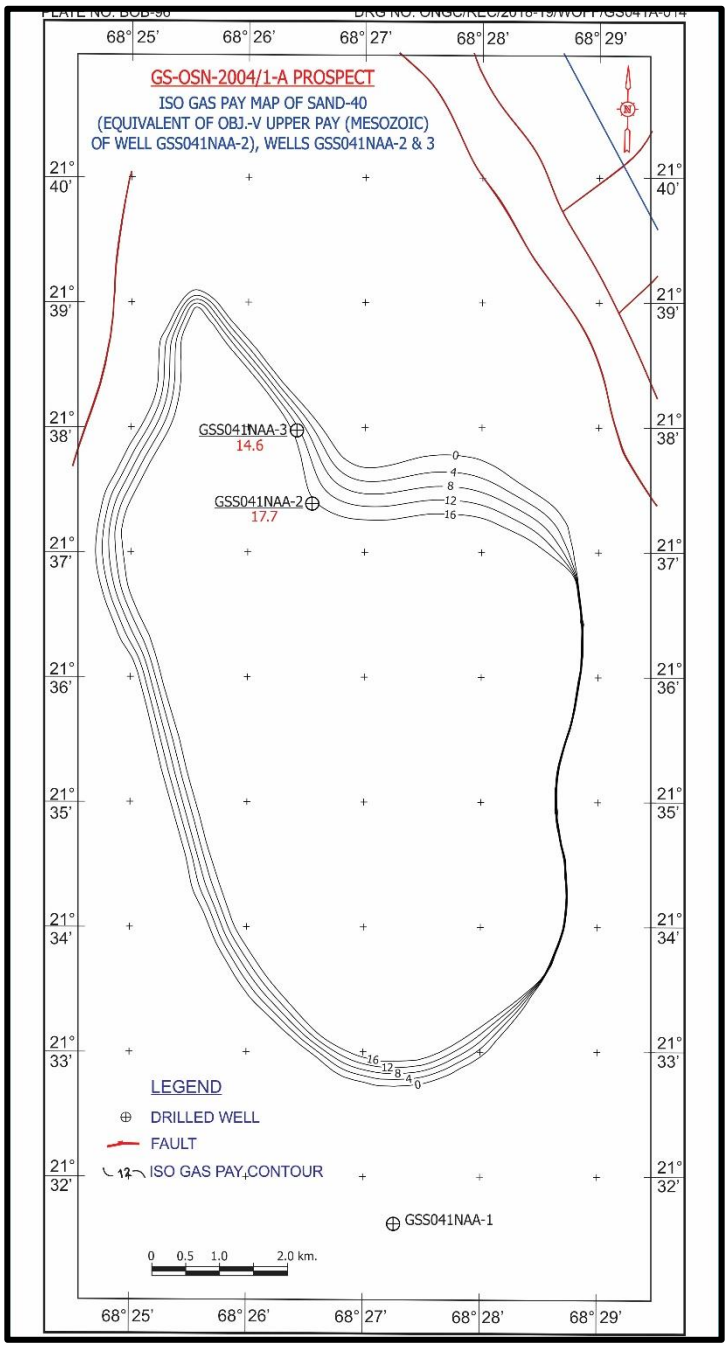


Figure 4-98: ISO Porosity, He, Sg map, Top of Object-V (GSS041NAA-2) - Sand 40

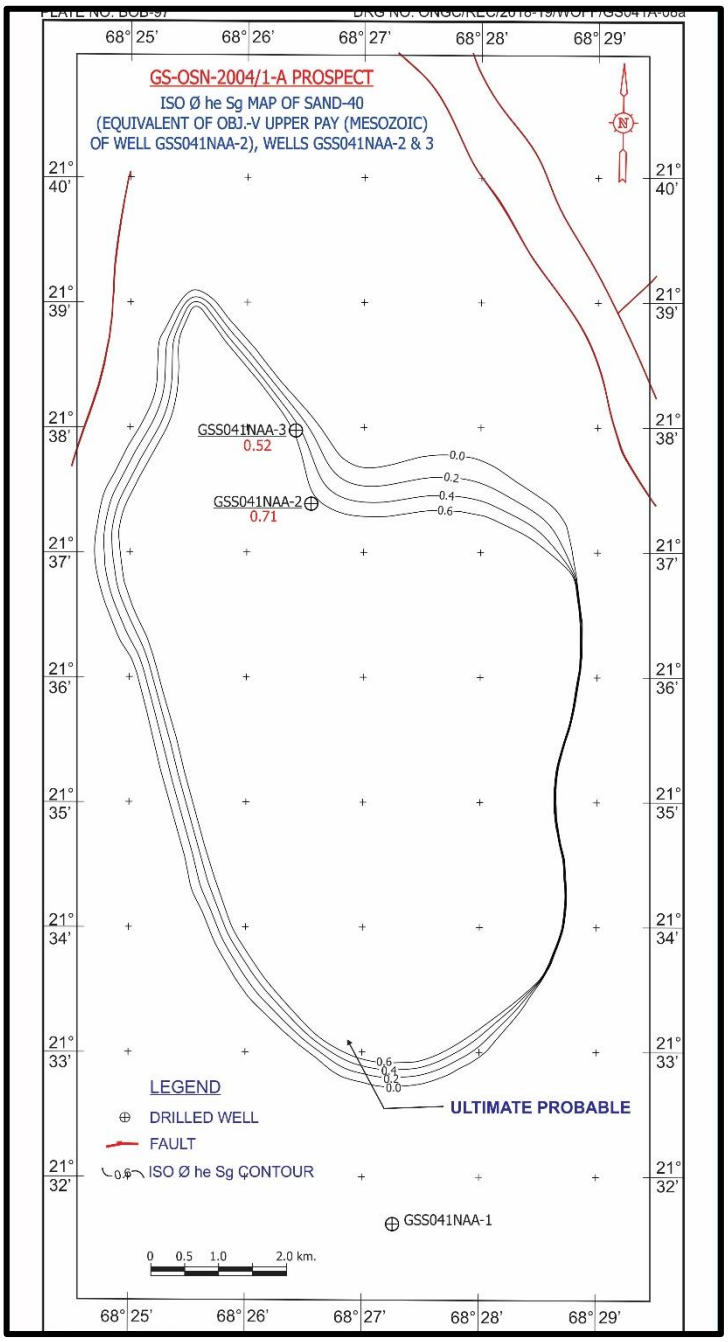


Figure 4-99: Iso Porosity, He, Sg map, Top of Object-V (GSS041NAA-2) - Sand 20

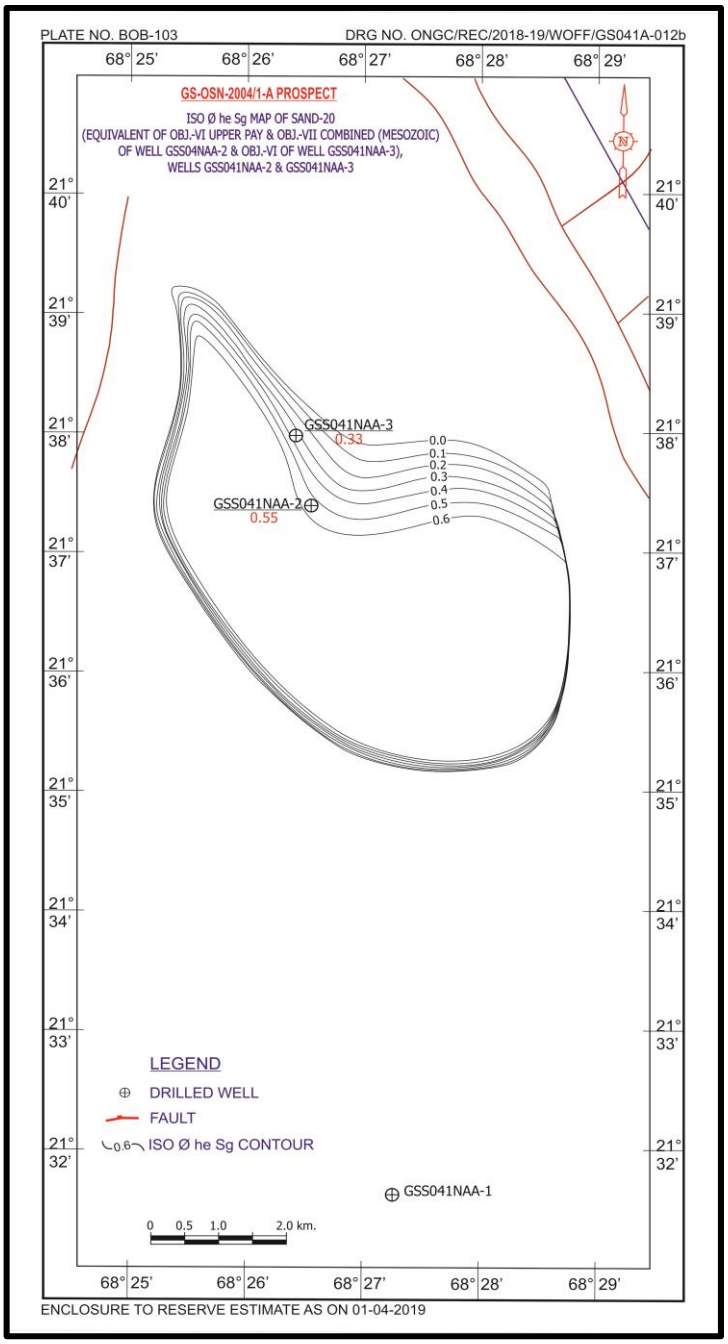


Figure 4-100: Iso Porosity, He, Sg map, Top of Object-V (GSS041NAA-2) - Sand 30

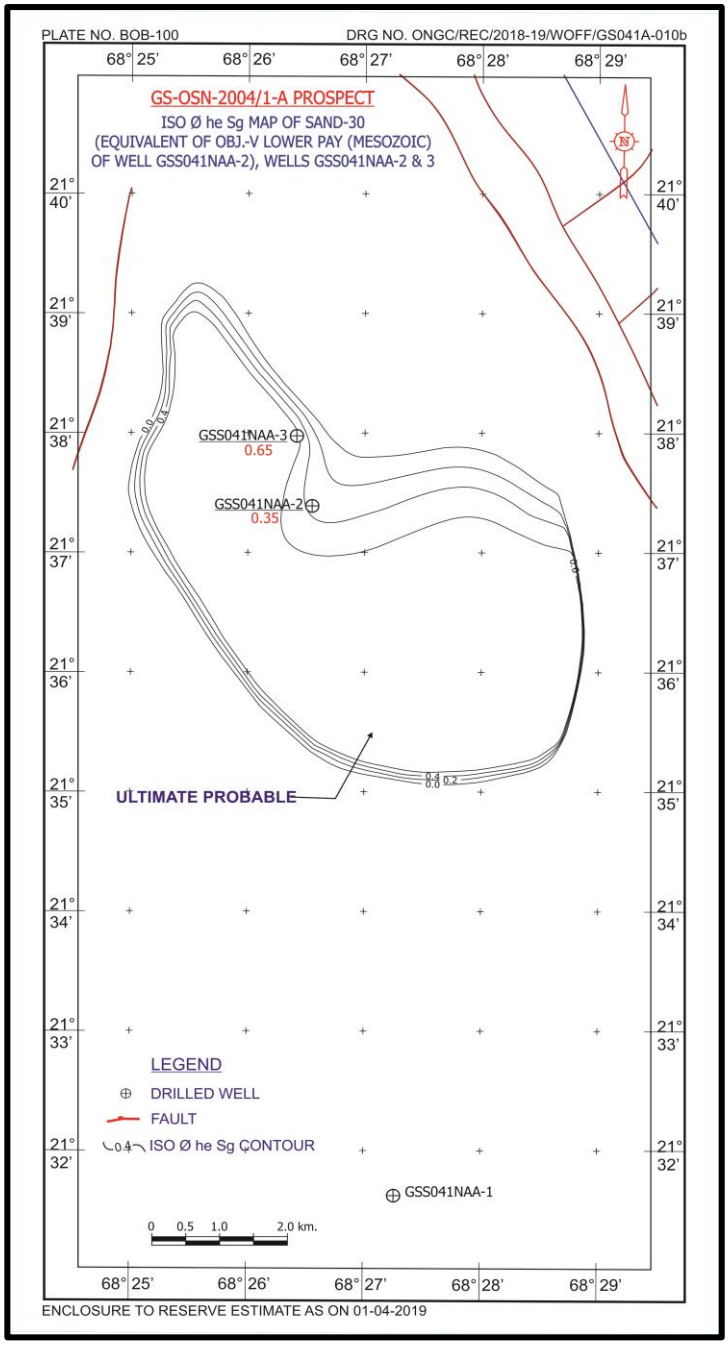
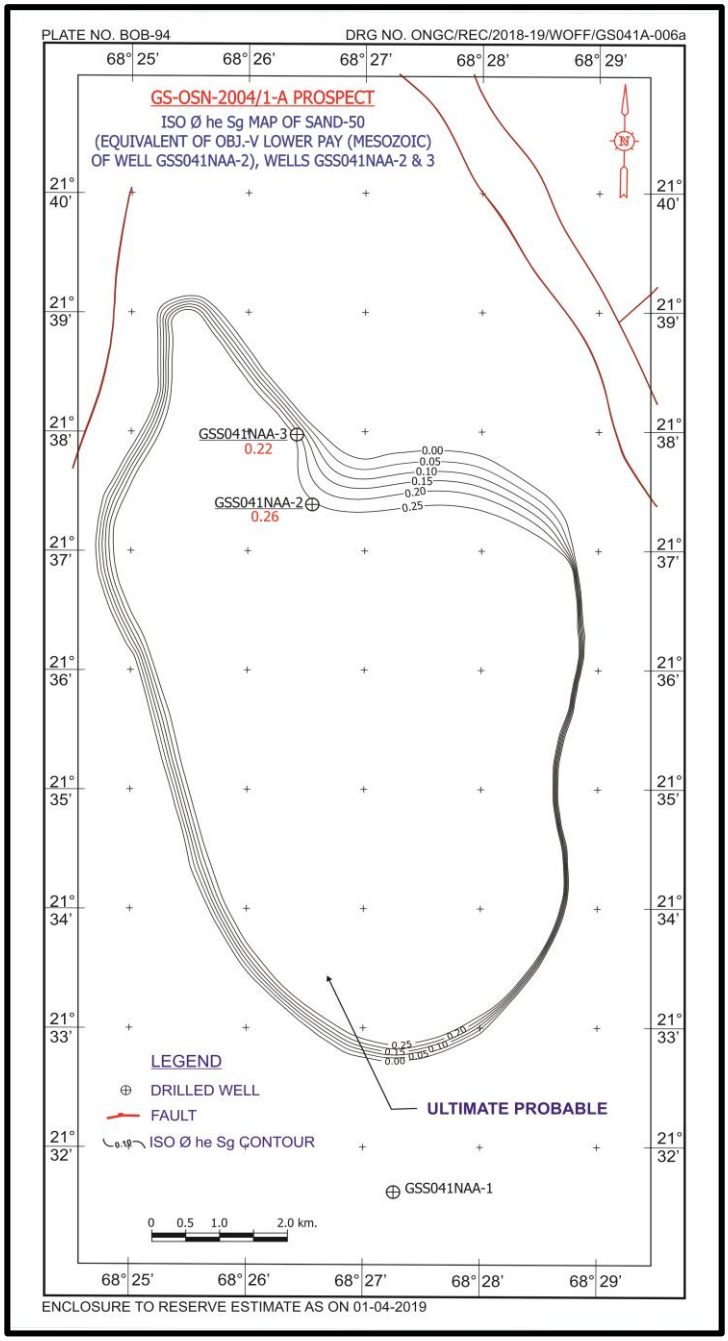


Figure 4-101: Iso Porosity, He, Sg map, Top of Object-V (GSS041NAA-2) - Sand 50



4.7.6 Reservoir parameters and hydrocarbon estimates (GSS041NAA-2)

Well GSS041NAA-2 was drilled as an appraisal well of GSS041NAA-1 on the northern extent of structure GSS041NAA-1 to chase the discovery made in GSS041NAA-1. The analysis of Object-V of well GSS041NAA-2 and seismic mapping suggest that pay in GSS041NAA-2 is a new pay (refer to Table 4-76 and Table 4-77). Pressure, Temperature, Flow rate, Log & seismic suggest that it is a new pay.

Table 4-76: GSS041NAA-2 – Reservoir parameters, the only flowed gas interval 4422-4434m

Interval	Gross Thickness	Net pay	Porosity	Water Saturation	Result
4422-4434m	**12**	**8.84**	**10**	**54**	**Flowed Gas**
4459-4483.5m	24.5		8	69	Gas & Water
4417.5-4435.5m	18		10	54	Gas bearing

Table 4-77: GSS041NAA-2 – Key volumetric parameters

Discovery	Reservoir	Area	He	Phi	Hydrocarbon Saturation	FVF
	Sand/ layer	**SqKM**	**m**	**%**	**Sg**	**Bg**
GSS041NAA-2	Mesozoic Obj-V UP (4422 - 4434m) [PS]	11.272	8.84	0.1	0.46	0.0033
GSS041NAA-2	Mesozoic Obj-V LP (4459 - 4483m) [PS]	39.15	10.05	0.08	0.31	0.0033
GSS041NAA-2	**Mesozoic Obj-V UP (4422 - 4434m) [PB]**	**56.257**	**8.84**	**0.1**	**0.46**	**0.0033**
GSS041NAA-2	Mesozoic Obj-V LP (4459 - 4483m) [PS]	55.031	10.05	0.08	0.31	0.0033

Table 4-78: GSS041NAA-2 – GIIP summary

Discovery	Reservoir	GIIP
	Sand/ layer	BCM
GSS041NAA-2	Mesozoic Obj-V UP (4422 - 4434m) [PS]	1.3890
GSS041NAA-2	Mesozoic Obj-V LP (4459 - 4483m) [PS]	2.9572
GSS041NAA-2	**Mesozoic Obj-V UP (4422 - 4434m) [PB]**	**6.9322**
GSS041NAA-2	Mesozoic Obj-V LP (4459 - 4483m) [PS]	4.1563
	Total 2P	**6.9322 BCM**

Erstwhile Operator-reported estimates on record:

The GSS041NAA-2 have a reported 2P (PB) gas estimate of **6.81 MMTOE**, considering the breakdown:

- GSS041NAA-2 Mesozoic Obj-V UP (4422 - 4434m) [PS] 1.571 **MMTOE**
- GSS041NAA-2 Mesozoic Obj-V LP (4459 - 4483m) [PS] 2.957 **MMTOE**

- GSS041NAA-2 Mesozoic Obj-V UP (4422 - 4434m) [PB] 6.81 **MMTOE**
- GSS041NAA-2 Mesozoic Obj-V LP (4459 - 4483m) [PS] 4.156 **MMTOE**

All these hydrocarbon estimates (

Table 4-78) are subject to future assessments based on Operator's own technical insights and additional information/data, which may warrant possible revision of the current estimates.

UPSIDE POTENTIAL of the Polygon GSOSN

Discovery of Mesozoic in wells GSS041NAA-1 & GSS041NAA-2 were identified & studied, based on low velocity zones below trap, acoustic inversions, orientation of sand bodies and structural analysis area towards north & north-east is identified for upside potential.

The Object-V within basalt in well GSS041NAA-1 was tested and flowed gas with 3348 m^3/day via ¼" choke. The possibility of weathering and fracturing of basalt outside the appraisal area is high as the appraisal well GSS041NAA-2 has shown continuous gas shows from basalt while drilling. This gas discovery was kept in PS category and hence no document of commerciality has been prepared.

Both the wells in the appraisal area proved to be hydrocarbon bearing. Due to various technical complications, all the identified objects could not be tested. Mesozoic clastic pays encountered in GSS041NAA-1 & GSS041NAA-2 were different.

The GSS041NAA-2 pay is terminating at the Trap bottom suggesting as we move in dip direction we may get younger sequences, and such kind of sequences may lead to stacked discoveries. Object-VI (4367.5-4371.5, 4378.5-4380.5 & 4387-4396m), well GSS041NAA-2, which could not be tested but proved to be hydrocarbon bearing in MDT results. It further strengthens the presence of stacked pays in the area.

As per DoC report for GS-OSN-2004/1 Block, the total envisaged upside potential of Mesozoic has been estimated to be around 65 BCM.

In GSOSN polygon, in addition to GSS041NAA-1 & GSS041NAA-2 discoveries, another well GKS041NAA-3 was spudded on 03.05.2018 and was drilled upto 4836m. The objective of the well was to establish the extension of hydrocarbon bearing Mesozoic reservoir and to test the un-concluded objects of well GSS041NAA-2. Six Objects were tested for Production Testing:

- Object-I (4615-4610m) in Jhuran Formation showed gas indication during final reverse out.
- Object-II (4558-4548m) which was also in Jhuran Formation was skipped.
- **Object-III (4458-4464m & 4470-4474m) in Bhuj Formation produced Gas @ 173821m3/day through 1/2" choke with non-measurable quantity of liquid (light oil/condensate). The estimated AOF of the well is 1.79 x10^5 m^3/d. K-1.19 mD**
- **Object-IV (4416–4407m & 4429–4424m) which was also in Bhuj Formation produced Gas @ 61394m3/day through 1/2" choke with non-measurable quantity of liquid (condensed water and condensate). AOF was estimated to be 62281 sm^3/d.K-0.22 mD**

- **Object-V (4380-4390m) in Bhuj Formation produced Gas @ 202421m3/day through 1/2" choke with little amount of liquid (condensed water and condensate). AOF came around 2.11x10^5 sm^3/d, K-2.29 mD.**
- Object-VI (4337-4346m) of Bhuj Formation showed gas indication during reverse out

In the Polygon GSOSN, there are three hydrocarbon bearing wells (GSS041NAA-1, GSS041NAA-2 & GSS041NAA-3) for which Gas In-place (BCM/MMTOE) has been reported by Erstwhile Operator:

GSS041NAA-1 : 25.75 BCM (PB-7.88 BCM + PS-17.87 BCM)

GSS041NAA-2 : 15.49 BCM (6.81 BCM+ 8.68 BCM)

4.7.7 Production Facility for Oil & Gas Evacuation

Production facilities for Oil & Gas Evacuation are summarized in Table 4-79.

Table 4-79: GSS041NAA-2 Production facility for Oil & Gas Evacuation

Sl No	Discovery Name	Basin	Water Depth (mtr)	Oil/Gas	Initial Testing details Gas Rate	Pay sand	Depth of discovered reservoir (TVDSS)	Near-by surface Facility with distance
1	GK-1 (GKS092NAA-1)	Kutch Shallow Offshore	3.5	Gas	Qg=115168 m3/d through ½" choke		898-902 mtr	Upcoming SunPetro Dwarka Onshore Terminal (GK-28) : 120 KM.Cairn Suvali Plant: 489 KM
2	GKOSN-2009/1-D (GKS091NDA-1)	Kutch Shallow Offshore	18	Gas	1,80,000 m3/d	Jakhau (Jakhau & Early Eocene)	1450m	No Facility exists in the region. Planned for evacuation to Dwarka
3	GKS091NFA-1 (GKS091NFA-1)	Kutch Shallow Offshore	19	Gas	2,36,524 m3/d	Weathered Dolerite (Naliya & Mid Cretaceous)	3770m	No Facility exists in the region (Planned for evacuation to Dwarka)
4	GK-OSN-2010-1-A(GKS101NAA-1)	Kutch Shallow Offshore	16	Gas	45,873 m3/d through 1/2" choke, FTHP 250psi	Jakhau (Jakhau & Early Eocene)	1260m	No Facility exists in the region (Planned for evacuation to Dwarka)
5	GK-OSN-2010-1-C (GKS101NCA-1)	Kutch Shallow Offshore	32	Gas	1,63,000 m3/d	Chhasra FM (Chhasra & Mid Miocene)	880m	No Facility exists in the region (Planned for evacuation to Dwarka)
6	GSOSN-2004/1-A (GSS041NAA-1)	Kutch Shallow Offshore	99	Gas	35,597 m3/d (3/8")	Jhuran & Late Jurassic	4370m	Dwarka-115 KM
7	GSS041NAA-B (GSS041NAA-2)	Kutch Shallow Offshore	92	Gas	1,56,563 m3/d	Bhuj & Early Cretaceous	4370m	Dwarka-115 KM

4.7.8 Status of Additional Wells in the area (Polygon)

In GSOSN polygon, 4 wells have been drilled (GSS041NAA-1, GSS041NAA-2, GSS041NAA-3 & SOE-3) out of GSS041NAA-1 & GSS041NAA-2 are the two gas discoveries. Well GSS041NAA-3 also produced gas on testing. Well SOE-3 did not produce anything on testing.

Data of all the wells other than discovery are given at 4.8

4.7.9 Main reports available for discovery well GSS041NAA-2

- Well Completion Report (WCR),
- Formation Evaluation report (FER)
- Reservoir Study Report (included in WCR) -
- Declaration of discovery (DoC), GK-OSN-2004/1, August 2016
- 3D Seismic interpretation report of GS-OSN-2004/1
- Formation Fluid Analysis
- Geo mechanical report of Core sample by IIT, Mumbai
- Sedimentological reports

4.8 STATUS OF ADDITIONAL WELLS IN GK/OSDSF/GKOSN/2025 CONTRACT AREA

The contract area (GK/OSDSF/GKOSN/2025) has three polygon GK-1, GKOSN & GSOSN areas which have seven discoveries (GKS092NAA-1, GKS091NDA-1, GKS091NFA-1, GKS101NAA_1, GKS101NCA-1, GSS041NAA-1, GSS04NAA-2) and 12 additional wells (Table 4-80). The status of the additional well(s) has been described field-wise in the following section, where reports/information were not available/accessible at the time of writing this report, the same may be enquired with NDR later.

Table 4-80: Summary of additional wells in GK/OSDSF/GKOSN/2025 contract area

Sl. No	Polygon	Area (Sq km)	Discoveries	Other wells
1	GK-1	50.45	1 (GKS092NAA-1)	-
2	GKOSN	1372.65	4 (GKS091NDA-1, GKS091NFA-1 GKS101NAA-1, GKS101NCA-1)	10 (GK-1-1 , GK-1-2 , GK-22C-1, GK-22C-2 , GK-22C-3 , GK-3-1, GK-40-1, GKS091NEA-1 , GKS101NDA-1 , GKS101NFA-1)
3	GSOSN	678.40	2 (GSS041NAA-1, GSS04NAA-2)	2 (GSS041NAA-3, SOE-3)

The results of other wells in the contract area are described in Table 4-81.

Table 4-81: Status of additional wells in GK/OSDSF/GKOSN/2025 contract area

A. GKOSN Polygon	
Well	**Well status**
GK-1-1	The well GK-1-1 was drilled in February 1989 to explore the hydrocarbon prospectivity upto Deccan trap and Mesozoic. The prospect was a structural closure at Eocene level. There was no oil & gas shows in the well during drilling. Logs and RFT were recorded. Production casing was not lowered. The well proved to be dry and abandoned.
GK-1-2	Th well was spudded in May 1993 and was drilled upto 4030m. The well was drilled to explore hydrocarbon potential of Mesozoic. Object-I (2890-2790m) was tested in Bhuj formation and on testing it produced 15 bbls of water of salinity 46800 ppm. The well proved to be dry.
GK-22C-1	The well GK-22C-1 was drilled in November 1991 and was drilled upto 3502m. The objective of the well was to test prospectivity in Cretaceous, Paleocene & Eocene sequences. Logs & RFT data were recorded. Two objects were tested. Object-I (3274-3279m) proved to be dry and Object-II (2840-2845m) produced gas as below

	24/64" Qgas –183124 m3/day at FTHP of 2350 psi **32/64 Qgas – 239980 m3/day at FTHP of 1700 psi** **40/64" Qgas – 280850 m3/day at FTHP 1350-1400 psi with Q Liq of 100 bpd which contains 60% water of salinity of 12870 ppm.**
GK-22C-2	Well GK-22C-2 was spudded in May 1994 and was drilled upto 3446m. The objective of drilling the well was to explore extension of pay zone encountered in GK-22C-1 and to test the pay zones below. There were Gas shows between 2700-3200m. The well has been found to be structurally lower w.r.t GK-22C-1 by around 198m at pay level. The well was abandoned without lowering production casing as there was no hydrocarbon zone at any level.
GK-22C-3	The well GK-22C-3 was drilled in an exploratory JV Block GK-OSJ-1 (Pre NELP) by RIL and was spudded in December 2002 and drilled upto 3823m to test the hydrocarbon prospectivity of Bhuj Formation and extent of GK-22C-1 horizontally and vertically. **The well intersected around 10m pay at Miocene level and in RFT produced gas in the intervals 849-852 m and 963-973 m. which seems to be of limited extent.** Wireline Logs, LWD, MDT were recorded in this well. Three objects were tested through DST Object-I(3741-3762m) observed no influx. Object-II(3290-3356m) observed no influx and Object-III(3164-3174m) observed negligible influx of Mud filtrate and water. The well was abandoned. It has been concluded that reservoir permeability is poor. WCR, FER, Testing and Close out report are available.
GK-3-1	The well GK-3-1 was spudded in May 2007 to explore the hydrocarbon prospectivity of Paleocene and cretaceous sequences. The well was drilled upto 4554m. Th well was abandoned without lowering 7" liner. Mild hydrocarbon shows were observed in Bhuj & Jhuran formations.
GK-40-1	The well was spudded in May 2000 and was drilled upto 3530m. The objective of the well was to explore the hydrocarbon potential of Mesozoic sequence (Equivalent to GK-22C-1). Minor gas shows were encountered at 1550m, 1576m. Bhuj formation was not encountered. Two objects were tested in Naliya formation, Object-I(3344-3346m) and Object-II(3235-3242m) and both proved to be dry.
GKS091NEA-1 (GK-OSN-2009/1)	Well was spudded in Jan 2017 and was drilled own to 2030m. The objective of the well was to explore hydrocarbon prospectivity of Mid Miocene, Early Eocene, Paleocene and Deccan trap. The well was drilled 42m in trap. During drilling, gas shows were observed in Tuna, Jakhau & Nakhtarana formations. Two objects were tested in this well. Jakhau formation is structurally deeper by around 90m w.r.t GKS091NDA-1

	Object-I in the interval 1866-1878m didnt flow any hydrocarbon. Reverse out sample contained water of salinity 33000-52500 ppm as Nacl. Object-II in the interval 1678-1681.5m, Jakhau formation, and didn't produce any hydrocarbons. Reverse out sample produced water of salinity 74250-97350 ppm as NaCl. The well proved to be dry.
GKS101NDA-1 (GK-OSN-2010/1)	The well GKS101NDA-1 was spudded in March 2019 with an objective to appraise the discovery GKS101NAA-1 and explore Paleocene and Deccan Trap. The well was drilled down to 1800m. The well was found structurally deeper at all levels w.r.t GKS101NAA-1 & GKS101NFA-1 minor Gas shows were observed at Godhra, Narayan Sarovar/Tuna, Jakhau & Nakhtarana formations. Object-I (1693-1800m), Barefoot Basement didn't show hydrocarbons and well was declared Dry.
GKS101NFA-1 (GK-OSN-2010/1)	The well was spudded in October 2017 and was drilled down to 1703m with an objective to explore the hydrocarbon prospectivity of Tertiary & weathered Basement. The well shallower at level w.r.t prognosis. Object-I (1301-1306m) was tested in Jakhau formation (Equivalent to Gas zone in GKA101NAA-1) and did not produce any hydrocarbon. The well was Dry.
B. GSOSN Polygon	
GKS041NAA-3 (GK-OSN-2004/1)	GKS041NAA-3 was spudded on 03.05.2018 and was drilled upto 4836m. The objective of the well was to establish the extension of hydrocarbon bearing Mesozoic reservoir and to test the un-concluded objects of well GSS041NAA-2. Six Objects were tested for Production Testing. Object-I (4615-4610m) in Jhuran Formation showed gas indication during final reverse out. Object-II (4558-4548m) which was also in Jhuran Formation was skipped. **Object-III (4458-4464m & 4470-4474m) in Bhuj Formation produced Gas @ 173821m3/day through 1/2" choke with non-measurable quantity of liquid (light oil/condensate). The estimated AOF of the well is 1.79 x10^5 m^3/d. K-1.19 mD** **Object-IV (4416–4407m & 4429–4424m) which was also in Bhuj Formation produced Gas @ 61394m3/day through 1/2" choke with non-measurable quantity of liquid (condensed water and condensate). AOF was estimated to be 62281 sm^3/d.K-0.22 mD** **Object-V (4380-4390m) in Bhuj Formation produced Gas @ 202421m3/day through 1/2" choke with little amount of liquid (condensed water and condensate). AOF came around 2.11x10^5 sm^3/d.** **K-2.29 mD.**

	Object-VI (4337-4346m) of Bhuj Formation showed gas indication during reverse out
SOE-3	Well SOE-3 was spudded in May 1996 and was drilled upto 1458m. The objective of the well was to explore Eocene-Paleocuene and volcanic ash above Deccan Trap. There was no gas shows or Fluorescence indication during drilling. In the absence of any hydrocarbon prospectivity, the well was abandoned without testing.

5. DATA PACKAGE INFORMATION

This information docket for the contract area, titled, GK/OSDSF/GKOSN/2025 is available with Data Package, which includes seismic data, well data and well completion and other reports. Apart from seismic and well data, the contract area has 20 reports. Given below is the detail of datasets that are available in the Data Package.

5.1 Well, Seismic Data and Reports Availability

5.1.1 Well Data: Kutch

Well Name	Latitude (DD)	Longitude (DD)	Coordinate System
GKS092NAA-1	23.0166667	68.6662556	WGS84
GK-1-1	22.8778644	68.1929739	WGS84
GK-1-2	22.8911872	68.1788422	WGS84
GK-22C-1	23.1529472	68.328675	WGS84
GK-22C-2	23.1104444	68.3559333	WGS84
GK-22C-3	23.1237889	68.3486417	WGS84
GK-3-1	22.8689278	68.5231306	WGS84
GK-40-1	22.8330172	68.3619955	WGS84
GKS091NDA-1	23.0280712	68.3394956	WGS84
GKS091NEA-1	22.9694163	68.305249	WGS84
GKS091NFA-1	22.9301003	68.3583256	WGS84
GKS101NAA-1	22.8700056	68.4801	WGS84
GKS101NCA-1	22.8248056	68.2958583	WGS84
GKS101NDA-1	22.8225242	68.4142492	WGS84
GKS101NFA-1	22.8195889	68.4853	WGS84
GSS041NAA-1	21.5270472	68.4543253	WGS84
GSS041NAA-2	21.6231272	68.4424969	WGS84
GSS041NAA-3	21.6329111	68.4402667	WGS84
SOE-3	21.4950278	68.5624972	WGS84

5.1.2 Seismic 2D data

GK/OSDSF/GKOSN/2025 contract area:

DSF-IV CONTRACT AREA	Line segment name	Processing type	FSP/CDP	LSP/CDP	Length (Km)	CRS
GK/OSDSF/GKOSN /2025	RB-70	FINAL_STACK	1	1541	18.491	WGS84 UTM 42N
	RB-26	FINAL_STACK	1	4529	42.738	WGS84 UTM 42N
	RB-26	FINAL_STACK	1	4529	0.6452	WGS84 UTM 42N
	RB-17	FINAL_STACK	1	5097	41.208	WGS84 UTM 42N
	KLP-38	FINAL_PSTM_STACK	1	6172	4.2544	WGS84 UTM 42N
	KLP-37	FINAL_PSTM_STACK	1	7803	33.055	WGS84 UTM 42N
	KLP-36	FINAL_PSTM_STACK	1	9062	16.978	WGS84 UTM 42N
	KLP-18	FINAL_PSTM_STACK	1	9091	5.7393	WGS84 UTM 42N
	KLP-17	FINAL_PSTM_STACK	1	6822	26.288	WGS84 UTM 42N
	KLP-16	FINAL_PSTM_STACK	1	4507	29.72	WGS84 UTM 42N
	KLP-14	FINAL_PSTM_STACK	1	11422	22.864	WGS84 UTM 42N
	KLP-06	FINAL_PSTM_STACK	1	4515	9.9018	WGS84 UTM 42N
	KLP-05	FINAL_PSTM_STACK	1	5063	10.336	WGS84 UTM 42N
	KLP-04	FINAL_PSTM_STACK	1	3724	10.324	WGS84 UTM 42N
	KD-95-154	FINAL_PSTM_STACK	1	4680	26.25	WGS84 UTM 42N
	KD-83-131	FINAL_PSTM_STACK	1	5368	12.851	WGS84 UTM 42N
	KD-81-125	FINAL_PSTM_STACK	1	10168	42.156	WGS84 UTM 42N
	KD-78-146	FINAL_PSTM_STACK	1	7935	0.0115	WGS84 UTM 42N
	KD-78-146	FINAL_PSTM_STACK	1	7935	2.0309	WGS84 UTM 42N
	KD-78-146	FINAL_PSTM_STACK	1	7935	8.8023	WGS84 UTM 42N
	KD-66-132	FINAL_PSTM_STACK	1	3432	4.1883	WGS84 UTM 42N
	KD-64-114	FINAL_PSTM_STACK	1	2768	6.6862	WGS84 UTM 42N
	KD-62-037	FINAL_PSTM_STACK	1	6184	3.1271	WGS84 UTM 42N
	KD-60-036	FINAL_PSTM_STACK	1	7016	5.5895	WGS84 UTM 42N
	KD-58-031	FINAL_PSTM_STACK	1	6440	5.0533	WGS84 UTM 42N
	KD-52-095	FINAL_PSTM_STACK	1	3392	3.323	WGS84 UTM 42N
	KD-52-046	FINAL_PSTM_STACK	1	1736	10.248	WGS84 UTM 42N
	KD-50-029	FINAL_PSTM_STACK	1	8920	7.5457	WGS84 UTM 42N
	KD-48-048	FINAL_PSTM_STACK	1	8704	2.0291	WGS84 UTM 42N
	KD-31-075	FINAL_PSTM_STACK	1	3792	3.9523	WGS84 UTM 42N
	KD-29-116	FINAL_PSTM_STACK	1	4136	6.8253	WGS84 UTM 42N
	KD-25-040	FINAL_PSTM_STACK	1	10944	3.118	WGS84 UTM 42N
	KD-23-074	FINAL_PSTM_STACK	1	9568	5.8314	WGS84 UTM 42N
	KD-21-039	FINAL_PSTM_STACK	1	9944	5.4304	WGS84 UTM 42N
	KD-17-066	FINAL_PSTM_STACK	1	7736	1.6242	WGS84 UTM 42N
	KD-15-052	FINAL_PSTM_STACK	1	4384	4.2784	WGS84 UTM 42N
	KD-13-058	FINAL_PSTM_STACK	1	6876	3.5171	WGS84 UTM 42N
	KD-102-153	FINAL_PSTM_STACK	1	2736	14.499	WGS84 UTM 42N
	KD-09-059	FINAL_PSTM_STACK	1	10696	2.0588	WGS84 UTM 42N
	KD-07-032	FINAL_PSTM_STACK	1	8696	3.267	WGS84 UTM 42N
	KD-05-060	FINAL_PSTM_STACK	1	8696	7.5598	WGS84 UTM 42N
	KD-03-034	FINAL_PSTM_STACK	1	8013	6.6302	WGS84 UTM 42N
	KD-01-065	FINAL_PSTM_STACK	1	3280	9.9855	WGS84 UTM 42N
	GK-96-47	FINAL_MIGRATION	1	2239	13.411	WGS84 UTM 42N
	GK-96-45	FINAL_MIGRATION	1	2965	18.877	WGS84 UTM 42N
	GK-96-43	FINAL_MIGRATION	1	2883	20.366	WGS84 UTM 42N
	GK-96-41	FINAL_MIGRATION	1	2682	18.418	WGS84 UTM 42N
	GK-96-39	FINAL_MIGRATION	1	3012	20.753	WGS84 UTM 42N
	GK-96-38	FINAL_MIGRATION	1	1881	13.712	WGS84 UTM 42N
	GK-96-38	FINAL_MIGRATION	1	1881	8.1056	WGS84 UTM 42N
	GK-96-37A	FINAL_MIGRATION	1	2332	5.9607	WGS84 UTM 42N
	GK-96-37	FINAL_STACK	1	1292	16.125	WGS84 UTM 42N
	GK-96-36	FINAL_MIGRATION	1	2653	31.009	WGS84 UTM 42N
	GK-96-35B	FINAL_MIGRATION	1	765	9.5565	WGS84 UTM 42N

GK/OSDSF/GKOSN/2025 contract area:

DSF-IV CONTRACT AREA	Line segment name	Processing type	FSP/CDP	LSP/CDP	Length (Km)	CRS
GK/OSDSF/GKOSN /2025	GK-96-35	FINAL_MIGRATION	1	1056	11.465	WGS84 UTM 42N
	GK-96-34	FINAL_MIGRATION	1	2377	23.65	WGS84 UTM 42N
	GK-96-33	FINAL_MIGRATION	1	2012	25.127	WGS84 UTM 42N
	GK-96-31A	FINAL_MIGRATION	1	2154	10.329	WGS84 UTM 42N
	GK-96-30	FINAL_MIGRATION	1	3053	23.074	WGS84 UTM 42N
	GK-96-29	FINAL_MIGRATION	1	3813	6.3196	WGS84 UTM 42N
	GK-96-28A	FINAL_MIGRATION	1	3602	22.069	WGS84 UTM 42N
	GK-96-27	FINAL_MIGRATION	1	3830	8.0544	WGS84 UTM 42N
	GK-96-26A	FINAL_MIGRATION	1	1576	13.017	WGS84 UTM 42N
	GK-96-26	FINAL_MIGRATION	1	3386	4.3237	WGS84 UTM 42N
	GK-96-25A	FINAL_MIGRATION	1	4414	8.2097	WGS84 UTM 42N
	GK-96-24	FINAL_MIGRATION	1	2239	5.881	WGS84 UTM 42N
	GK-96-04	FINAL_MIGRATION	1	5035	11.565	WGS84 UTM 42N
	GK-96-02A	FINAL_MIGRATION	1	3925	19.435	WGS84 UTM 42N
	GK-73WA	FINAL STACK	1	5464	6.4346	WGS84 UTM 42N
	GK-71W	FINAL_STACK	1	6020	11.905	WGS84 UTM 42N
	GK-71RE	FINAL_STACK	3416	7651	12.498	WGS84 UTM 42N
	GK-69W	FINAL_PSTM_STACK	1	4768	19.256	WGS84 UTM 42N
	GK-69RE	FINAL_STACK	3610	8445	18.884	WGS84 UTM 42N
	GK-67WB	FINAL STACK	1	2314	9.6812	WGS84 UTM 42N
	GK-67WA	FINAL_STACK	1	2616	19.403	WGS84 UTM 42N
	GK-65WB	FINAL_PSTM_STACK	1	1638	5.6714	WGS84 UTM 42N
	GK-65WB	FINAL_PSTM_STACK	1	1638	5.6714	WGS84 UTM 42N
	GK-65WA	FINAL_PSTM_STACK	1	2046	13.365	WGS84 UTM 42N
	GK-65W	FINAL_PSTM_STACK	1	2040	17.426	WGS84 UTM 42N
	GK-63W	FINAL STACK	1	4321	7.9111	WGS84 UTM 42N
	GK-63W	FINAL STACK	1	4321	7.9111	WGS84 UTM 42N
	GK-63W	FINAL STACK	1	4321	28.403	WGS84 UTM 42N
	GK-63B	FINAL_PSTM_STACK	8096	10031	6.3389	WGS84 UTM 42N
	GK-61WC	FINAL STACK	1	1487	1.6655	WGS84 UTM 42N
	GK-61WC	FINAL STACK	1	1487	1.6655	WGS84 UTM 42N
	GK-61WB	FINAL_PSTM_STACK	426	4311	30.009	WGS84 UTM 42N
	GK-59W	FINAL STACK	1	4581	23.481	WGS84 UTM 42N
	GK-59A	FINAL_PSTM_STACK	1	2336	12.238	WGS84 UTM 42N
	GK-59	FINAL_STACK	104	4611	15.833	WGS84 UTM 42N
	GK-57W	FINAL_STACK	1	4254	20.305	WGS84 UTM 42N
	GK-57	FINAL_STACK	305	5554	19.323	WGS84 UTM 42N
	GK-55W	FINAL_PSTM_STACK	1	3474	15.41	WGS84 UTM 42N
	GK-55A	FINAL_PSTM_STACK	1	2656	19.626	WGS84 UTM 42N
	GK-55	FINAL_STACK	104	4453	19.292	WGS84 UTM 42N
	GK-53W	REPROCESSED_FINAL_STACK	1	1439	17.578	WGS84 UTM 42N
	GK-51W	FINAL_PSTM_STACK	1	3360	26.037	WGS84 UTM 42N
	GK-51	FINAL_STACK	104	3225	9.8288	WGS84 UTM 42N
	GK-49WA	FINAL STACK	1	2315	16.16	WGS84 UTM 42N
	GK-49B	FINAL_PSTM_STACK	1	2476	19.364	WGS84 UTM 42N
	GK-48	FINAL_PSTM_STACK	1	3344	6.4743	WGS84 UTM 42N
	GK-47W	FINAL STACK	1	1363	14.524	WGS84 UTM 42N
	GK-47R	REPROCESSED_FINAL_STACK	1	921	3.8278	WGS84 UTM 42N
	GK-47A	FINAL_PSTM_STACK	4496	5211	8.9674	WGS84 UTM 42N
	GK-46	FINAL_PSTM_STACK	1	5132	11.864	WGS84 UTM 42N
	GK-45W	FINAL_PSTM_STACK	1	3686	25.807	WGS84 UTM 42N
	GK-45A1	FINAL_STACK	305	2042	8.2885	WGS84 UTM 42N
	GK-45A	FINAL_STACK	305	2510	7.2149	WGS84 UTM 42N
	GK-44	FINAL_PSTM_STACK	1	2775	9.7572	WGS84 UTM 42N

GK/OSDSF/GKOSN/2025 contract area:

DSF-IV CONTRACT AREA	Line segment name	Processing type	FSP/CDP	LSP/CDP	Length (Km)	CRS
GK/OSDSF/GKOSN /2025	GK-43	FINAL_STACK	305	2330	20.54	WGS84 UTM 42N
	GK-41	FINAL_STACK	305	1274	13.849	WGS84 UTM 42N
	GK-39	FINAL_STACK	305	3976	38.744	WGS84 UTM 42N
	GK-37W	FINAL STACK	1	2681	21.78	WGS84 UTM 42N
	GK-37C	FINAL_STACK	305	3402	11.263	WGS84 UTM 42N
	GK-37B	FINAL_STACK	305	1334	18.308	WGS84 UTM 42N
	GK-35	FINAL_STACK	305	4002	23.563	WGS84 UTM 42N
	GK-33W	FINAL STACK	1	2633	17.083	WGS84 UTM 42N
	GK-33	FINAL_PSTM_STACK	1	3814	3.5653	WGS84 UTM 42N
	GK-31W	FINAL_PSTM_STACK	1	3678	10.686	WGS84 UTM 42N
	GK-29	FINAL_STACK	104	2999	5.1566	WGS84 UTM 42N
	GK-26B	FINAL_PSTM_STACK	4033	11920	6.8978	WGS84 UTM 42N
	GK-24B	FINAL_STACK	104	1845	17.325	WGS84 UTM 42N
	GK-24	FINAL_PSTM_STACK	1	5412	6.8481	WGS84 UTM 42N
	GK-22W	FINAL STACK	1	5756	5.0188	WGS84 UTM 42N
	GK-22	FINAL_PSTM_STACK	1	4014	32.307	WGS84 UTM 42N
	GK-20W	FINAL_PSTM_STACK	1	4932	24.902	WGS84 UTM 42N
	GK-20B	FINAL_PSTM_STACK	1	4696	8.2234	WGS84 UTM 42N
	GK-20A	FINAL_PSTM_STACK	1	1776	22.573	WGS84 UTM 42N
	GK-201E	FINAL_MIGRATION	1	19149	9.3281	WGS84 UTM 42N
	GK-201E	FINAL_MIGRATION	1	19149	9.3281	WGS84 UTM 42N
	GK-201E	FINAL_MIGRATION	1	19149	20.97	WGS84 UTM 42N
	GK-20	FINAL_PSTM_STACK	1	1294	11.344	WGS84 UTM 42N
	GK-18W	FINAL STACK	1	4668	31.899	WGS84 UTM 42N
	GK-18	FINAL_STACK	104	2681	51.801	WGS84 UTM 42N
	GK-154W	FINAL_PSTM_STACK	1	3044	2.22	WGS84 UTM 42N
	GK-146WB	FINAL_STACK	1	3894	16.032	WGS84 UTM 42N
	GK-146WA	FINAL STACK	1	4034	34.545	WGS84 UTM 42N
	GK-146WA	FINAL STACK	1	4034	9.7898	WGS84 UTM 42N
	GK-144WC	FINAL STACK	130	1426	11.804	WGS84 UTM 42N
	GK-142WB	FINAL_STACK	1	3718	3.8603	WGS84 UTM 42N
	GK-142W	FINAL_PSTM_STACK	1	6088	2.4485	WGS84 UTM 42N
	GK-142W	FINAL_PSTM_STACK	1	6088	4.2463	WGS84 UTM 42N
	GK-136W	FINAL STACK	1	5540	3.9877	WGS84 UTM 42N
	GK-136W	FINAL STACK	1	5540	3.9877	WGS84 UTM 42N
	GK-134WA	FINAL STACK	1	1793	5.0549	WGS84 UTM 42N
	GK-134WA	FINAL STACK	1	1793	5.0549	WGS84 UTM 42N
	17	MIGRATION_STACK	3525	7900	8.1289	WGS84 UTM 42N
	17	MIGRATION_STACK	3525	7900	8.1289	WGS84 UTM 42N
	15	MIGRATION_STACK	3524	8424	5.3606	WGS84 UTM 42N
	15	MIGRATION_STACK	3524	8424	5.3606	WGS84 UTM 42N
	15	MIGRATION_STACK	3524	8424	4.4091	WGS84 UTM 42N
	14	MIGRATION_STACK	3524	8891	6.8482	WGS84 UTM 42N
	14	MIGRATION_STACK	3524	8891	6.8482	WGS84 UTM 42N
	13	MIGRATION_STACK	3525	9340	4.3751	WGS84 UTM 42N
	12	MIGRATION_STACK	3529	9300	6.3159	WGS84 UTM 42N
	12	MIGRATION_STACK	3529	9300	6.3159	WGS84 UTM 42N
	11	MIGRATION_STACK	3525	8612	3.6276	WGS84 UTM 42N
	1	FINAL_PSTM_STACK	2000	11000	18.142	WGS84 UTM 42N
	09	MIGRATION_STACK	3525	7924	3.5818	WGS84 UTM 42N
	07	MIGRATION_STACK	3525	7200	3.5548	WGS84 UTM 42N
	04	MIGRATION_STACK	3524	7983	0.0159	WGS84 UTM 42N
	02	MIGRATION_STACK	3524	6835	3.7171	WGS84 UTM 42N
	02	MIGRATION_STACK	3524	6835	4.1963	WGS84 UTM 42N

DSF-IV CONTRACT AREA	Line segment name	Processing type	FSP/CDP	LSP/CDP	Length (Km)	CRS
GK/OSDSF/GKOSN /2025	GK-64RE	FINAL_STACK	104	4851	32.689	WGS84 UTM 42N
	GK-64A	FINAL_STACK	104	2239	23.595	WGS84 UTM 42N
	GK-62	FINAL_STACK	104	3423	37.085	WGS84 UTM 42N
	GK-62	FINAL_STACK	104	3423	1.7307	WGS84 UTM 42N
	GK-125B	FINAL_STACK	104	6300	8.3354	WGS84 UTM 42N
	GK-125A	FINAL_STACK	104	2821	5.0682	WGS84 UTM 42N
	GK-123	FINAL_STACK	104	4647	4.4196	WGS84 UTM 42N
	GK-110A	FINAL_STACK	305	3444	5.5697	WGS84 UTM 42N
	GK-108	FINAL_STACK	305	5792	15.002	WGS84 UTM 42N
	GK-100	FINAL_STACK	305	5796	3.2116	WGS84 UTM 42N
	GK-94-15	PSDM_SCALED_TO_TIME	2	6132	0.1351	WGS84 UTM 42N
	GK-94-11	PSDM_SCALED_TO_TIME	2	9776	4.1055	WGS84 UTM 42N
	KL-37	PSDM_SCALED_TO_TIME	4159	11042	14.526	WGS84 UTM 42N
	GK-90	RAW_STACK	6165	10788	3.7691	WGS84 UTM 42N
	KL-47	FINAL_PSTM_STACK	1	12304	20.533	WGS84 UTM 42N
	KL-46	FINAL_PSTM_STACK	1	9313	2.4459	WGS84 UTM 42N
	KL-46	FINAL_PSTM_STACK	1	9313	37.436	WGS84 UTM 42N
	KL-38	FINAL_PSTM_STACK	1	6644	9.6806	WGS84 UTM 42N
	KL-36	FINAL_PSTM_STACK	1	6571	23.748	WGS84 UTM 42N
	KL-35	FINAL_PSTM_STACK	1	6540	21.565	WGS84 UTM 42N
	KL-34	FINAL_PSTM_STACK	1	6482	23.716	WGS84 UTM 42N
	KL-33	FINAL_PSTM_STACK	1	6462	19.77	WGS84 UTM 42N
	KL-32	FINAL_PSTM_STACK	1	6424	17.803	WGS84 UTM 42N
	KL-31	FINAL_PSTM_STACK	1	6410	15.825	WGS84 UTM 42N
	KL-30	FINAL_PSTM_STACK	1	6378	9.8787	WGS84 UTM 42N
	KL-29	FINAL_PSTM_STACK	1	6342	7.1776	WGS84 UTM 42N
	KL-28	FINAL_PSTM_STACK	1	6276	3.5898	WGS84 UTM 42N
	KL-17	FINAL_PSTM_STACK	1	8061	25.497	WGS84 UTM 42N
	KL-16	FINAL_PSTM_STACK	1	8159	40.737	WGS84 UTM 42N
	KL-15	FINAL_PSTM_STACK	1	8259	42.717	WGS84 UTM 42N
	KL-14	FINAL_PSTM_STACK	1	8363	38.674	WGS84 UTM 42N
	KL-13	FINAL_PSTM_STACK	1	8457	1.2479	WGS84 UTM 42N
	KL-13	FINAL_PSTM_STACK	1	8457	25.993	WGS84 UTM 42N
	KL-12	FINAL_PSTM_STACK	1	8551	20.422	WGS84 UTM 42N
	GK-94A	FINAL_PSTM_STACK	1	4216	12.936	WGS84 UTM 42N
	GK-92	FINAL_PSTM_STACK	1	3574	9.2454	WGS84 UTM 42N
	GK-88RE	FINAL_PSTM_STACK	326	7541	15.429	WGS84 UTM 42N
	GK-86	FINAL_PSTM_STACK	1	11256	17.168	WGS84 UTM 42N
	GK-84	FINAL_PSTM_STACK	1	10732	4.634	WGS84 UTM 42N
	GK-60	FINAL_PSTM_STACK	1	5626	1.9265	WGS84 UTM 42N
	GK-60	FINAL_PSTM_STACK	1	5626	1.4311	WGS84 UTM 42N
	GK-60	FINAL_PSTM_STACK	1	5626	11.307	WGS84 UTM 42N
	GK-175	FINAL_PSTM_STACK	1	5926	15.252	WGS84 UTM 42N
	GK-173	FINAL_PSTM_STACK	1	6926	21.038	WGS84 UTM 42N
	GK-110	FINAL_PSTM_STACK	1	3114	5.6521	WGS84 UTM 42N
	GK-106	FINAL_PSTM_STACK	1	11064	7.3113	WGS84 UTM 42N
	GK-104	FINAL_PSTM_STACK	1	10584	7.9731	WGS84 UTM 42N
	GK-102	FINAL_PSTM_STACK	1	4394	7.114	WGS84 UTM 42N
	GK-64B	FINAL_MIGRATION	1	7940	39.249	WGS84 UTM 42N
	GK-62B	FINAL_MIGRATION	1	9230	34.262	WGS84 UTM 42N
	GK-171A	FINAL_MIGRATION	1	3910	21.818	WGS84 UTM 42N
	GK-165	FINAL_MIGRATION	1	6450	9.3219	WGS84 UTM 42N
	GK-162	FINAL_MIGRATION	1	3380	19.937	WGS84 UTM 42N
	GK-160	FINAL_MIGRATION	1	4310	27.812	WGS84 UTM 42N
	GK-160	FINAL_MIGRATION	1	4310	1.2578	WGS84 UTM 42N
	GK 64B	FINAL_MIGRATION	1	7940	36.729	WGS84 UTM 42N
					2956.8896	

5.1.3 Seismic 3D Data

00003.GK-OSN-2009_1_2_FINAL_PSTM_STACK_.sgy
3D bin centre corner points - all traces

3D bin centre corner points - all traces : 00003.GK-OSN-2009_1_2_FINAL_PSTM_STACK_.sgy

Point	Inline	Crossline	Easting	Northing
1	307	976	472571.09	2546970.75
2	1980	976	450238.28	2511605.75
3	1980	5400	403480.84	2541134.75
4	307	5400	425813.25	2576499.75

00002.GS-OSN-2004_1_BROADBAND_VERSION_1_FINAL_PSTM_STACK_.sgy
3D bin centre corner points - all traces

3D bin centre corner points - all traces : 00002.GS-OSN-2004_1_BROADBAND_VERSION_1_FINAL_PSTM_STACK_.sgy

Point	Inline	Crossline	Easting	Northing
1	1147	1142043136	459377.88	2370966.25
2	2940	1142043136	446317.47	2413846.00
3	2940	1142526976	423717.66	2406962.75
4	1147	1142526976	436779.09	2364084.25

00001.GK-OSN-2010_1_FINAL_PSTM_STACK_.sgy
3D bin centre corner points - all traces

3D bin centre corner points - all traces : 00001.GK-OSN-2010_1_FINAL_PSTM_STACK_.sgy

Point	Inline	Crossline	Easting	Northing
1	1000	3774	414520.50	2532749.00
2	1666	3774	414443.00	2516100.00
3	1666	7059	455505.16	2515909.25
4	1000	7059	455581.94	2532560.25

5.2 Data Package Cost

The Data Package contains seismic (2D and/or 3D) and well data along with reports. The cost of the Data Package of this Information Docket (GK/OSDSF/GKOSN/2025 contract area) comes to be USD 26,230. This cost is as per the current data policy of NDR, DGH at the time of writing this report and subject to changes if data rates or policy framework are revised.

COST OF DATA PACKAGE FOR DSF-IV BLOCKS								
S.No.	**Contract Area on offer**	**AREA (SQ KM)**	**NIO Map reference no.**	**Total Wells**	**2D Seismic (LKM)**	**3D Seismic (SKM)**	**No. of Reports**	**FINAL COST in USD ($)**
1	GK/OSDSF/GKOSN/2025	2101.51	S-4	19	2956.89	2067.64	52	**26,100**

6. CONTRACT AREA SUMMARY

Contract area name	: GK/OSDSF/GKOSN/2025 NIO reference no. S-4
Geographical area	: Gulf of Kutch & Saurashtra OFFSHORE
Number of field(s)/discoveries	: 7
Number of well(s)	: 19
Total area	: 2101.5 Sq. Km.
Seismic 2D data	: 2956.8 8 Line Km.
Seismic 3D data	: 2067.64 Sq. Km.
Report(s) available	: 52
Hydrocarbon In-Place (2P), O+OEG	: 30.99 MMTOE
Data package cost	: USD 26,100

7. CONCLUSIONS

The information docket has been prepared from the geoscientific and engineering data sets, made available by NOCs/ Private/JV Operators (7 discoveries) along with earlier offered DSF acreage (1 discovery). The work has been primarily accomplished over Microsoft Access RDBMS tool with all requisite data/information pre-processed using various in-house interpretation software. Desktop publishing applications of documents, spreadsheets and images including Google maps have also been extensively used.

The 7 discoveries, which are lying unpursued and holding contingent resources/ reserves are potential to be further developed/commercially produced. This booklet will be an useful supplement to the Data Package of corresponding Contract Area. Such data represent 2D/3D seismic, well logs and reports on key information from various field operations pertaining to drilling, logging, testing and production. In addition to 7 discovery wells, there are two hydrocarbon bearing wells in the contract area i.e GK-22C-1 and GKS041NAA-3.

The total data package on offer under this bid round includes 2956.89 LKM 2D seismic, 2067.64 SKM 3D seismic, 19 well data. The Data Package will be hosted in Data rooms for viewing and for sale from National Data Repository (NDR) to the interested investors/ bidders.

Though, the docket mentions estimated hydrocarbon, it is to indicate extent and order of hydrocarbon pool size. DGH strongly recommends that bidders must have their own understanding and independent assessment of resource base to support any forward bidding decision.

पेट्रोलियम एवं
प्राकृतिक गैस मंत्रालय
MINISTRY OF
PETROLEUM AND NATURAL GAS

सत्यमेव जयते

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