

**APACHE NORTHWEST PTY LTD**

**GEOLOGICAL PROGNOSIS**

**GRAYLING-1**

**EXPLORATION LICENCE**

**VIC/P-54**

**VICTORIA**

## **CONTENTS**

Page No:

1.	GENERAL INFORMATION	1
2.	GEOLOGICAL SUMMARY	2
3.	STRATIGRAPHIC PROGNOSIS	3
4.	GEOLOGICAL PROCEDURES	4
1.	MUDLOGGING AND SAMPLING PROGRAMME	4
2.	CORING PROGRAMME	8
3.	WIRELINE LOGGING PROGRAMME (OPEN HOLE)	9
4.	LOGGING WHILE DRILLING PROGRAMME (LWD)	12

## **FIGURES**

After Page No:

1.	Grayling-1 Location Map	3
2.	Top Admiral Formation Sandstone Depth Structure Map	3
3.	Seismic line – Sunfish and Northern Fields 3D tie line	3

## 1. GENERAL INFORMATION

OPERATOR: APACHE NORTHWEST PTY LTD

WELL NAME: Grayling-1

WELL TYPE: Exploration

PERMIT: VIC/P-54

PERMIT HOLDERS: Apache Northwest Pty Ltd  
Nexus Energy Ltd

SURFACE LOCATION:

Lat:	38° 09' 40.24" S	5,775,511.5 mN
Long:	148° 17' 35.95" E	613,303.2 mE
	GDA94	GRS80

PRIMARY OBJECTIVE:

Lat:	38° 09' 40.24" S	5,775,511.5 mN
Long:	148° 17' 35.95" E	613,303.2 mE
	GDA94	GRS80

RT-AHD: 25.0 m

WATER DEPTH - AHD: 57.0 m

PROPOSED TOTAL DEPTH: 2944.0 mMDRT (-2919.0 mTVDAHD)

## 2. GEOLOGICAL SUMMARY

The Grayling prospect is a structural closure located 7.4 km south of the Longtom discovery, 5.6 km ESE Sunfish-2, 6.1 km NE of Turrum-1 and 6.5 km WNW of Kahawai-1 in the SE corner of VIC/P-54. The crest of the feature is approximately 37.8 km from the nearest landfall.

The Grayling structure is a NE-SW trending faulted anticline with some fault independent four-way dip closure. It is located within the Rosedale Fault System on the southern edge of the Northern Terrace of the Gippsland Basin. The structure formed in response to NW directed compression and transpression which began in the Early Eocene and continued episodically with varying intensity through to the Pliocene. Major pulses of compression affected the basin during the Lower Oligocene, Middle Miocene and Pliocene. A series of NE to ENE trending anticlines, including the Grayling structure, are the result of this compression. The Grayling prospect is bounded to the north and south two SE-NW trending normal faults with downthrows to the SSW. Both of these faults are part of the Rosedale Fault System. At the *F. longus* level there is both fault independent (four-way dip) closure and fault dependent closure. At the deeper Golden Beach Sub-group level there also appears to be fault independent closure again with a greater area of fault dependent closure possible if there is appropriate seal across adjacent faults.

Closure is mapped at the top of the *F. longus* (Maastrichtian) section of the Halibut Sub-group (Volador Formation). In the nearby wells of Remora-1 Sunfish-1 and -2 this section comprises alternating sandstones and shales with minor coal. These were deposited in back-barrier/lower coastal plain environments. Sandstone beds are 4 m to 10 m thick with a trend to become thicker and more blocky towards the base of the section. Thicker sandstone beds with large scale cross bedding have been interpreted as fluvial point bar deposits. Sandstones are predominantly medium to coarse grained. Dolomite, silica and calcareous cements are recorded as are loose friable aggregates. Average porosities from log analysis are in the order of 19-24% (Sunfish-2) at depths up to 2500 m. Porosity also varies with facies with porosity degradation with depth less marked in fluvio-deltaic texturally mature and moderately well sorted channel sandstones compared to other facies. The thickness of the Volador Formation (top *F. longus* to top Campanian Volcanics) in Sunfish-1 and -2 is 291 m and 218 m respectively whilst at Remora-1 it is 518 m thick. Although these three are located close to each other the variation indicates significant stratigraphic growth across faults which separate the wells. To the SE at Tuna-1 the same section is 503 m.

The deeper reservoir objective for Grayling are Campanian (*T. lilliei* to *N. senectus* biozones) Golden Beach Sub-group sandstones. The top of the Golden Beach Sub-group section in nearby wells (Sunfish-1 and -2 and Remora-1) is marked by 40-50 m of highly weathered, fine grained basic, volcanics of *T. lilliei* age. The Golden Beach Sub-group sandstones are typically upper delta plain / fluvial deposits in this part of the basin. Log derived porosity versus depth for this interval in Sunfish-1 and -2 and Remora-1 shows a range from ~11% at depths down to 2950 m to ~19% at depths around 2300 m. Intra-Golden Beach Sub-group volcanics (*N. senectus* biozone) are present in both Sunfish-1 and -2 and provide a proven intra-formational top seal. These older volcanics can be expected in Grayling-1 and provide the deepest objective for the well to intersect. The base of these volcanics are in the order of 130-170 m below the base of the younger volcanics.

The key risk for Grayling-1 is lateral cross fault seal. The structure is bound to north and south by two faults with lowside fault closure required to the north and highside fault closure to the south. To the north the Volador Formation reservoir objective is cross-faulted against the lower part of the Volador Formation and the top of the Golden Beach Sub-group. Cross fault seal will be largely dependent upon lithological juxtapositions. The *T. lilliei* age volcanics at the top of the Golden Beach Sub-group are by analogy to the Kipper Field likely to provide good lateral cross fault seal. Sandstone on sandstone juxtapositions, from offset well data in the basin, will not seal.

For the deeper Golden Beach Sub-group objective weathered volcanics are believed to provide good top seal. In Sunfish-1 weathered volcanics of *T. lilliei* age act as the top seal for 10.4 m net oil pay. In the same well older volcanics of *N. senectus* age top seal over 6 m of net gas pay within thin Golden Beach Sub-group sandstones. The deeper Golden Beach Sub-group objective is cross-faulted against deeper part of the Golden Beach Sub-group on the upthrown side of the fault. Good cross-fault seals can be expected where juxtaposition is against intra-formational shales and/or volcanics.

The source rock for hydrocarbons in the Gippsland are the coals and coaly mudstones of the Golden Beach and Halibut Sub-groups. The presence of several commercial fields in the area demonstrates the effectiveness of the source and migration pathway.

The main risk for Grayling-1 is seal, particularly cross-fault seal. Within the Gippsland Basin interbedded sandstones, siltstones, coals and shales of the Halibut and Golden beach Sub-groups have sealed laterally across faults with favourable cross-fault juxtaposition. Sandstone on sandstone cross-fault juxtapositions have typically not acted as effective seals in the basin. For the deeper Golden Beach Sub-group objective reservoir quality at depth is also a risk.

# PROPOSED GRAYLING-1 LOCATION MAP

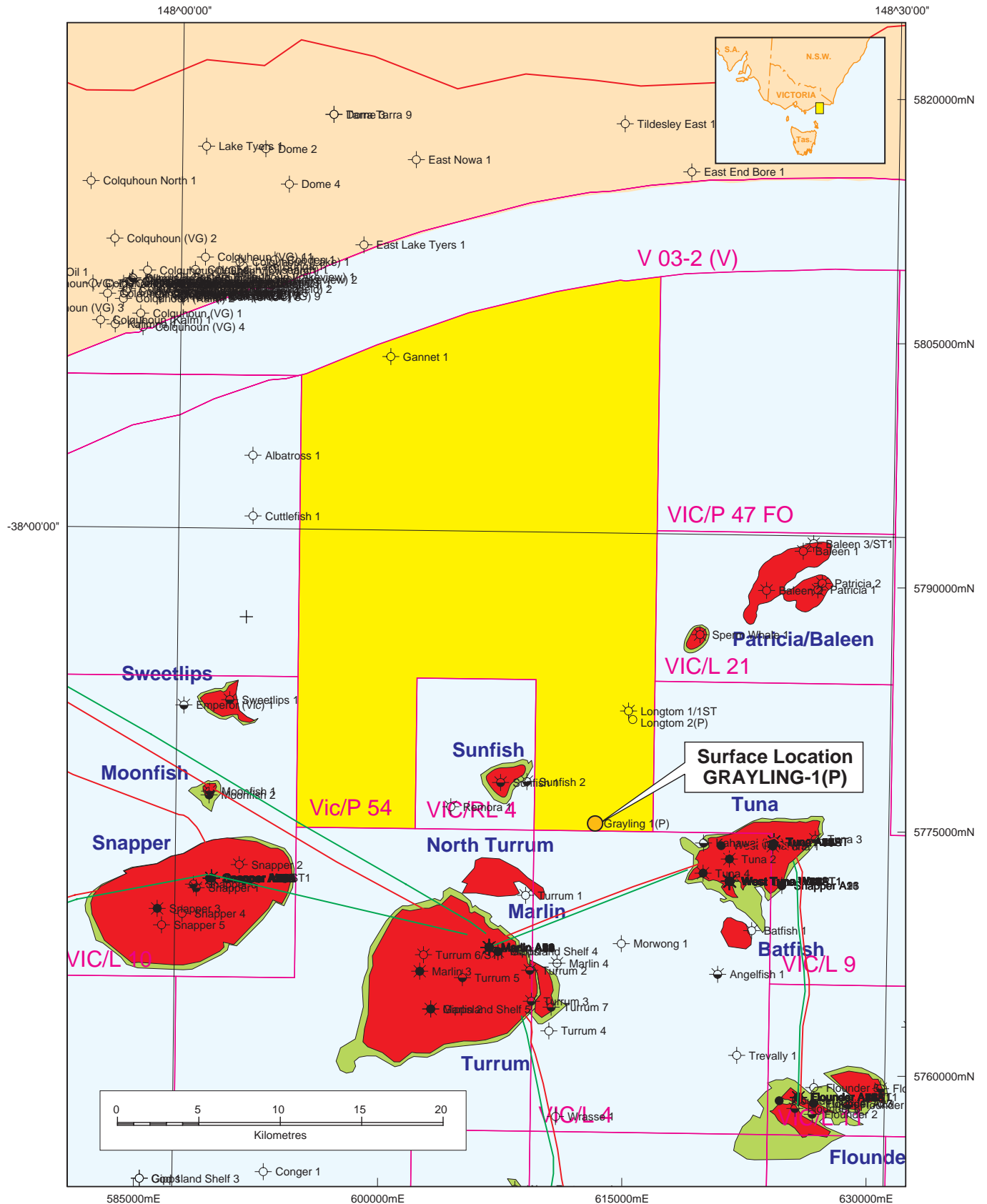
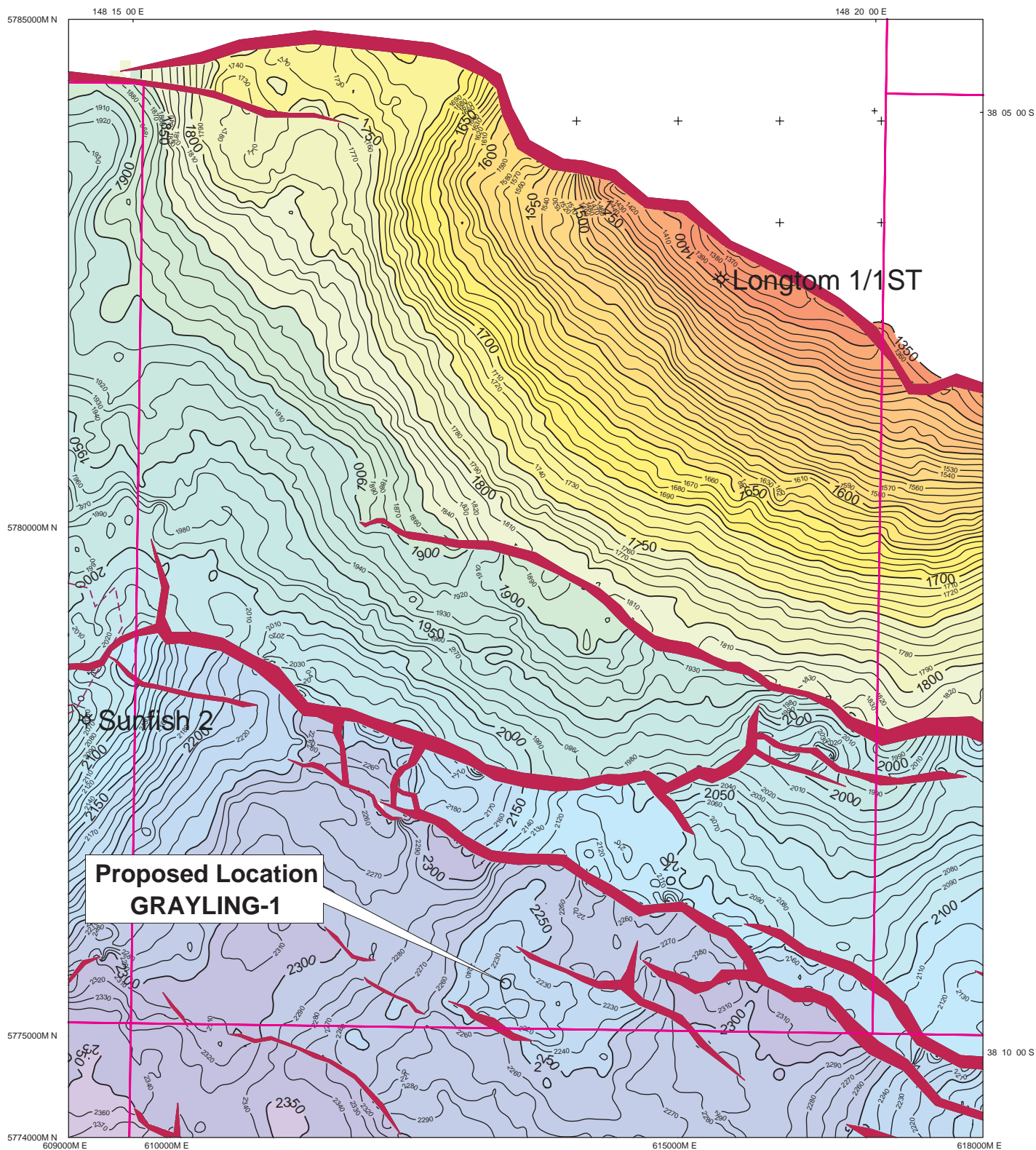
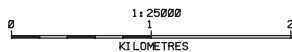


Figure 1



CONTOUR INTERVAL: 10m



UNIVERSAL TRANSVERSE MERCATOR PROJECTION  
G.R.S. 1980 SPHEROID  
CENTRAL MERIDIAN 147 00 00 E  
MAPSHEET DATUM "GDA94"



VIC/P54

Grayling-1 Predrill  
Depth Structure Map

F Longus Marker

(IW depcon)

Author: RLK, IW	Date: September 10, 2004
Mapsheet: VICP54, SE ONLY	Scale:
Map File: vicp54_065_FLOD_D.grayling.map	Plan No.: RLKu8517

Figure 2



# Grayling-1: Sunfish & Northern Fields 3D tie line

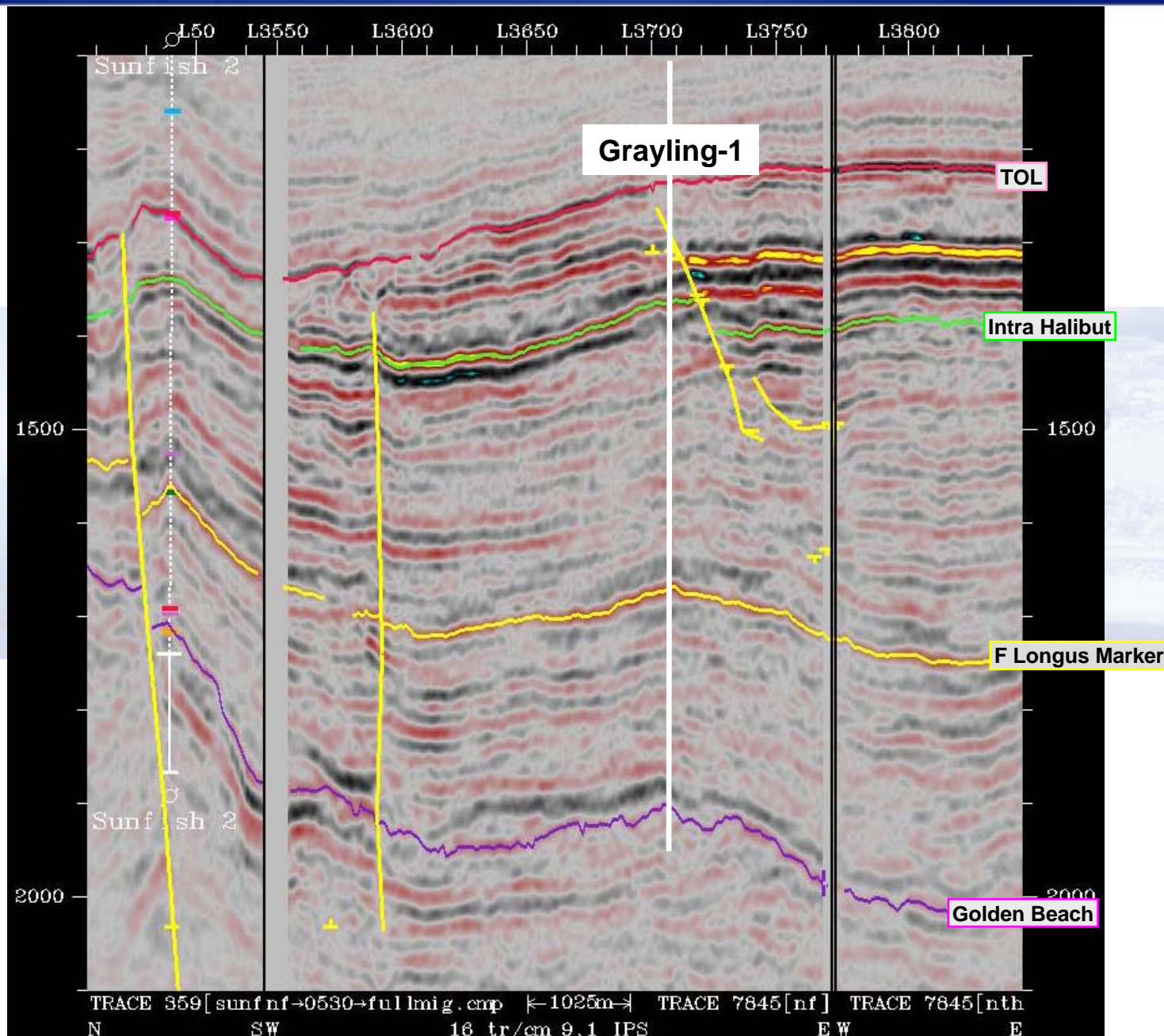


Figure 3



### 3. STRATIGRAPHIC PROGNOSIS

FORMATION	TRUE VERTICAL DEPTH (mTVDAHD)	THICKNESS (mTVT)	MEASURED DEPTH (mMDRT)	LITHOLOGY
RT-AHD	+25.0	N/A	0.0	
Gippsland Limestone (Sea Bed)	-57.0	1368.0	82.0	Interbedded calcarenite, calcisilite and calcilutite.
Lakes Entrance Fm	-1425.0	95.0	1450.0	Interbedded calcarenite, calcisilite, grading to calcilutite with depth.
Gurnard Fm / Top Latrobe Group	-1520.0	60.0	1545.0	Siltstone, grading to very fine grained sandstone
Top Halibut Sub-Group	-1580.0	630.0	1605.0	Interbedded sandstone, siltstone and coal.
Normal Fault	-1632.0			
Kate Shale	-2210.0	10.0	2235.0	Marine mudstones and sandstones with accessory glauconite.
Top Volador Fm <i>F. longus</i> section	-2220.0	400.0	2245.0	Sandstone.
Top Campanian Volcanics	-2620.0	50.0	2645.0	Intermediate to basic variably weathered volcanics.
Top <i>T. lilliei</i> Golden Beach Sub-Group sandstones	-2670.0	130.0	2695.0	Sandstone with minor shale.
Top <i>N. senectus</i> Intra-Golden Beach Volcanics	-2800.0	19.0	2825.0	Intermediate to basic variably weathered volcanics.
Top <i>N. senectus</i> Golden Beach Sandstones	-2819.0	>100.0	2844.0	Sandstone with minor shale.
<b>TD</b>	<b>-2919.0</b>		<b>2944.0</b>	

## **4. GEOLOGICAL PROCEDURES**

### **1. MUDLOGGING AND SAMPLING PROGRAMME**

The following instructions are a guide and may be modified at the discretion of the Wellsite Geologist. Significant changes should be discussed with the Operations Geologist in the Perth Office. The mudlogging personnel will familiarise themselves with and follow these instructions unless directed otherwise by the Wellsite Geologist. Compliance with many of these instructions will require the co-operation of supervisory personnel of both Apache and the drilling contractor, as well as of the mudlogging engineer.

#### **1.1 GENERAL INSTRUCTIONS**

- 1.1.1 Collect drilling data from surface. Commence logging the 340 mm (12 1/4") and 216 mm (8 1/2 ) hole sections. Full fluid returns are expected from 244 mm (9 5/8") casing shoe to total depth. Samples should be collected whenever possible. Digital drilling data should be collected at the highest possible data density in a time based file from spud to 150 m below the sea bed.
- 1.1.2 Carbide checks are to be run at least once per shift (more often if hole conditions are changing rapidly). The mathematically derived theoretical lag time and the actual lag time are to be recorded in the lithological description column as equivalent pump strokes.
- 1.1.3 If gas dilution of mud, mud loss or pit volume increase is noted, instruct driller to stop drilling immediately and check for flow, then notify the Wellsite Geologist and Drilling Supervisor as quickly as possible.
- 1.1.4 Mud logs should be kept up to date at all times.
- 1.1.5 A hard copy of the mudlog in A4 format will be provided with the Wellsite Geologist's morning report along with an Acrobat file (\*.pdf) of the mudlog to be transmitted to Perth each morning. The mudlogging data engineer will submit drilling engineering reports to the Apache Drilling Representative at 06:00 and 15:30 hours covering activities over the proceeding 24 hours and 9 hours respectively.
- 1.1.6 The data engineer is to maintain a trip condition log plotting the occurrence and magnitude of tight hole and required reaming throughout the well.

- 1.1.7 The mudlogger is to maintain the hole cleaning and condition record supplied by the client and make data available in ASCII format.
- 1.1.8 Calcimetry to be run every 25 m. If there is a large variation in percentages between these sampling points, run analyses every five metres. In samples described as having more than 10 percent calcite/dolomite run analysis regardless.
- 1.1.9 Gas ratio plots are to be run on all oil and gas shows and on any recovered gas from wireline formation tester or DST.
- 1.1.10 Shale densities are to be run when requested by Wellsite Geologist.
- 1.1.11 Cuttings gas analysis to be run every 25 m or more frequently in high gas zones, at the Wellsite Geologist's discretion.
- 1.1.12 A file in ASCII format of engineering and gas data is to be supplied to the wellsite geologist for transmission to Perth office as soon as possible at the end of each hole section.
- 1.1.13 The mudlogging personnel are to ensure that sufficient: sample containers - plastic and rot proof cloth bags, samplex trays, cardboard boxes and wireline formation tester fluid containers (100 and 500 ml Pyrex sample jars along with 5 litre screw top cans) are on the rig at the start of the well.
- 1.1.14 The quality control weekly checklist is to be given to the Wellsite Geologist each Friday.
- 1.1.15 Two disks containing merged data in ASCII format to be provided with a provisional copy of the "Final Well Report" for proof reading as soon as possible after drilling. Two copies of the "Final Well Report" (one bound, one unbound) plus a sepia copy of the Formation Evaluation Log to be provided after completing any amendments requested by Apache. A disk containing postscript print files (\*.ps) and Acrobat files (\*.pdf) of the Formation Evaluation Log and Final Well Report should also be presented at this time.

## 1.2 SAMPLE REQUIREMENTS

Collect the following samples (every 5 metres) unless otherwise instructed by the Wellsite Geologist:

### 1.2.1 Dry Samples: lightly washed (air dried):

One (1) set 200+ grams in polythene bags for Apache.

One (1) set 200+ grams in polythene bags for AGSO.

One (1) set 200+ grams in polythene bags for DPI.

One set of washed and dried samples in plastic 'samplex' trays for Apache.

### 1.2.2 Sample Labelling and Shipping

- When it is not possible to catch samples, as in lost circulation zones, an empty bag should be included in the sequence of samples, and clearly labelled to show the interval of missing samples and the reason why they are missing. Such intervals should be noted on the transmittal letters together with any intervals with less than the minimum required sample volume.
- Water resistant felt tip pens are required for polythene bags, and marker pens with paper bags. Lead pencils must not be used. Samples should be well packed in order.
- All samples are to be sent to: Kestrel Information Management, 39 McDowell Street Welshpool WA 6106 Attn: Barry Lloyd at the completion of drilling. Each box should be individually marked with the well name and depth interval.
- Dry samples are to be boxed separately and clearly labelled so the individual sets are easily identifiable.
 

Set 1:	Apache
Set 2:	DPI
Set 3:	AGSO
- "Samplex" trays are to be placed in the small wooden boxes supplied by the manufacturer, depths are to be written on the end of each tray as well as the lids.

- Wireline formation tester and DST samples to be sent as soon as possible from the rig Kestrel Information Management or to a laboratory as advised by the Operations Geologist.
- All sample shipments must be accompanied by a transmittal advice. A copy of this advice is to be sent to Apache Energy Limited, Level 3, 256 St. George's Terrace, Perth, WA 6000 - Attention: Operations Geologist.

### 1.3 CIRCULATING INSTRUCTIONS

- 1.3.1 Circulate bottoms up routinely before all trips, but with slow drilling this may be waived at the discretion of the Wellsite Geologist.
- 1.3.2 Circulate after all operations or occurrences that could affect a proper evaluation of any new hydrocarbon-bearing zones below that depth, i.e:
1. Drill-stem tests.
  2. Lost circulation regained below possible oil zones, etc.
  3. High trip gas.

Circulating instructions may be communicated directly to the driller but the Apache Drilling Supervisor must be informed directly afterwards.

## 2. CORING PROGRAMME

Coring may be conducted in a sidetrack hole through the objective should a significant hydrocarbon column be indicated from shows and LWD logs. Core barrel lengths of up to 27 m per core run may be required with capacity on location to cut up to 54 m of core. The coring programme is designed to define reservoir properties and determine GOC and OWC contacts through the reservoir section as required in the event of a hydrocarbon discovery.

### 2.1 CORE HANDLING

- 2.1.1 Thin sleeve system fibreglass inner core sleeves will be used for conventional core recovery. The core should be retained in 9 m lengths and shipped in a modified testing basket. Prior to sealing, representative rock chips will be removed from the end of each core section for well-site lithology and show description.
- 2.1.2 Each core sleeve section is to be marked with adjacent red and black lines along its length (red on the left); arrows pointing downhole will be marked at regular intervals on each piece of core sleeve on the black line. Measured RT depths should be marked on each sleeve at 0.5 metre intervals, on the top and bottom of each sleeve and on the end caps.
- 2.1.3 Core sleeve sections and contained core should be packed firmly in core crates and transported to Perth via helicopter and then air freight to Perth. For air transport, individual core crates must not weigh more than 100 kg as airline staff safe work practices prevent handling items exceeding this limit. Care will be taken to damage the core as little as possible during transport.

### 2.2 CORE LABELLING AND SHIPPING

- 2.2.1 The following information should be taped to the outside and inside (in thick transparent envelopes) of the lid of each core crate or attached to the shipping basket:
  - Well Name
  - Core Number
  - Total cored interval



Recovery (in metres)

Interval in crate

No. of lengths of core in crate

Note: a photocopy of this information should also be faxed to Apache  
Perth attention: Operations Geologist.

- 2.2.2 Core boxes should be shipped to Core Laboratories as soon as possible.  
Transportation method for the core to be agreed with Apache, Perth, who  
should also be notified of the shipment.

Core Samples:

1/3 of core samples for AGSO.

1/3 of core samples for DPI.

1/3 of core samples for Apache Energy Ltd.

### 3. **WIRELINING LOGGING PROGRAMME (OPEN HOLE)**

#### **Suite No. 1      Total depth to 340 mm (13 3/8") casing shoe.**

- Run 1    RCI (To define hydrocarbon contacts and obtain fluid samples - if required)
- Run 2    VSP/Checkshot survey (if required)
- Run 3    STAR-CBIL (if required)
- Run 4    RCOR - rotary sidewall coring tool (if required).
- Run 5    SWC 30 levels (if required)

**Note:** All primary logging measurements will be replaced by quad-combo LWD. A conventional wireline supercombo toolstring will be available in all circumstances as backup.

**Objective:** Provide a complete suite of formation evaluation logs for detailed petrophysical analysis. An RCI pressure survey may be conducted to confirm any hydrocarbon contacts by intersection of gradients if hydrocarbon contacts can not be adequately defined. FMI sampling will be required to determine the exact nature of any indicated hydrocarbons. All possible precautions must be taken to avoid differential sticking of the RCI tool. STAR to obtain stratigraphic dip information in a discovery well and have electromagnetic image capability to investigate detailed stratigraphy/sedimentology if required. Provide a high quality VSP or checkshot survey. Provide sidewall core coverage for measurement of reservoir properties, lithological determination, hydrocarbon content, dating and geochemical analyses, if required. All SWC samples to be returned to DPI after analysis.

#### **GENERAL WIRELINING LOGGING INSTRUCTIONS, ALL RUNS**

- 3.1 The Apache Logging Supervisor is to hand the Logging Engineer an "Order on Wireline Logging" at least 1 hour before logging commences. Any problems should be discussed. The "Order on Wireline Logging" will detail the generalities laid out in this programme.
- 3.2 The Wireline Logging Engineer is to measure mud and mud filtrate resistivity on a mud sample taken from the flow line by the Mud Engineer before POOH to log. The temperature of resistivity measurements should be recorded.
- 3.3 The Apache Logging Supervisor is to provide the Logging Engineer with the hole size, casing size, intervals of any hydrocarbon occurrences, all mud properties and other data required for a complete log heading.

- 3.4 The Apache Logging Supervisor is to record circulating time on bottom and time circulation stopped on the appropriate form and ensure that the Wireline Engineer includes these comments in the remarks portion of the header.
- 3.5 Two thermometers are to be run on each tool. The Apache Logging Supervisor should note the time the tool was last on bottom, ensuring that these times are in agreement with those on the log. If the DTD is used, both digital and analogue temperatures will be noted on the log header. The maximum of these values will be used for the bottom hole temperature.
- 3.6 Overlap previous logging run with all curves by at least 40 m or with gamma ray if overlap interval is in casing. Overlap scale changes.
- 3.7 Unless otherwise instructed, basic (GR-RES-BAT) logs should be acquired while running in (fastest possible acquisition mode). If logging tools hang up, logs should be acquired on the first trip out of the hole.
- 3.8 The repeat section should be acquired over the reservoir interval (this instruction may be modified at the discretion of the Apache Logging Supervisor).
- 3.9 In the event a Toolpusher run is made, depths will be tied to the drillers' pipe tally.
- 3.10 In the event the logging tool becomes stuck the Drilling Supervisor will be informed immediately.
- 3.11 No playbacks or quicklooks will be required in Grayling-1.  
Office based data processing of the checkshot data will be required as soon as possible. Intervals and timing of processing should be arranged with the Apache office.
- 3.12 All logs will be taped (4 mm DAT tape or EXABYTE in LIS format) and an ASCII file will be made available. The ASCII file will include data from all tools.
- 3.13 Two sets of field prints of all logs and the tapes will be forwarded to Perth as soon as possible. Liaise with Head Office re fax/remote transmission of key intervals.
- 3.14 One set of all logs should be retained on the rig for wellsite use. The Apache Logging Supervisor should ensure that the Drilling Supervisor has copies of all logs that he requires.
- 3.15 The Apache Logging Supervisor should be especially careful to ensure that all logs, computer interpretations and replays are properly labelled, with any anomalies, scale changes and reasons for parameter changes documented.

- 3.16 The Logging Engineer/Seismic Specialist should not leave the location until all quicklooks and Apache office personnel have reviewed logs.
- 3.17 The log heading will include the tool configuration, suite and run numbers (as per above logging programme), depth interval, scale and date. TD latitudes and longitudes for deviated holes will also, if possible, be noted in the remarks.
- 3.18 The following standard environmental corrections will be applied to generate an NPHI curve:

Limestone matrix  
DSN borehole size correction  
Casing/cement correction

- 3.19 Scale should normally be as follows:-

<u>LOG</u>	<u>VERTICAL</u>	<u>HORIZONTAL</u>	<u>TRACK</u>	<u>REMARKS</u>
DLL-MSFL	1/200, 1/500	0.2 to 200	2	logarithmic
GR (& CSNG)	1/200, 1/500	0 to 150	1	Backup 150-300. Standard scales for K, Th and U.
CALIPER	1/200, 1/500	6 to 16"	1	
FWS/LSS	1/200, 1/500	140 to 40	3	140-240 backup to extend into track 2.
SLD	1/200, 1/500	1.95 to 2.95	2 + 3	
DSN	1/200, 1/500	+45 to -15	2 + 3	
PEF	1/200, 1/500	0 to 10	3	
DRHO	1/200, 1/500	-.25 to .25	3	

#### 4. **LOGGING WHILE DRILLING PROGRAMME (LWD)**

LWD formation evaluation logging will be undertaken on Grayling-1.

The 311 mm hole section will be logged while drilling with directional, gamma ray, resistivity and sonic tools (DGR-EWRP4-BAT). This consists of a mud pulse telemetry system for real time transmission of directional, gamma ray, resistivity and sonic data, with probes to record all the data downhole. Logging of the 216 mm hole section will be by LWD quad-combo wireline replacement to give high quality directional, gamma ray, resistivity, neutron porosity, density, caliper and sonic data (DGR-EWRP4-SDL-CND-ACAL-BAT). This consists of a mud pulse telemetry system for real time transmission, with probes to record all the data downhole.

- 4.1 A short repeat section will be conducted in recorded only mode (with the pumps off to minimise hole erosion) across the reservoir after reaching TD. The Apache Wellsite Geologist will provide the interval and the data will be acquired at the fastest possible rate to obtain a recorded only log for repeatability.
- 4.2 During the logging of any section the LWD crew are to obtain measurements of the mud and mud filtrate resistivity and temperature as required (at least once per tour) to accurately determine the corrected formation resistivity response. These data should be recorded on the log along with all other pertinent information concerning the well.
- 4.3 All depth related information should be checked with the Apache Wellsite Geologist and Drilling Supervisor before any final logs are produced. It is important to note that with the wireline replacement technique, LWD provides the primary depth reference for the well and a great deal of attention must be paid to pipe/BHA measurements.
- 4.4 The LWD crew are to provide, to the Apache Wellsite Geologist a daily 24 hr record of the logs recorded on clearly labelled 3½" computer disk (in ASCII format). These data will be transmitted to the Perth office together with the mudlogging data to be available by no later than 6:30 am each morning. The data are to be recorded against regular depth intervals of 0.1 m.
- 4.5 Any geologically significant or anomalous responses should be reported to the Apache Wellsite Geologist or Drilling Supervisor immediately.
- 4.6 The LWD crew is to ensure a real-time, on-line log is available at all times for the Apache Wellsite Geologist and Drilling Supervisor and those key intervals can be transmitted to

the Perth office as soon as possible if required.

- 4.7 A set of all logs should be retained on the rig for wellsite use. The Apache Wellsite Geologist should ensure that the Drilling Supervisor has copies of all logs that are required.
- 4.8 It is the responsibility of the Apache Wellsite Geologist to ensure that all wellsite logs, computer interpretations and replays are properly labelled, with any anomalies, scale changes and reason for parameter changes documented. Special attention should be paid to the details recorded in the log header and remarks in track 5 ensuring these are correct and all information required is present.
- 4.9 Scales should normally be as follows:-

<u>Log</u>	<u>Vertical</u>	<u>Horizontal</u>	<u>Track</u>	<u>Remarks</u>
GR	1/200, 1/500	0-150 API	1	API equivalent. Backup to wrap.
ROP	1/200, 1/500	100-0 m/hr	1	
RES	1/200, 1/500	0.2-200 ohmn	2	App. & Corr. Data logarithmic
NEUTRON POR.	1/200, 1/500	+45 to -15	3	Backup to extend into track 2.
BULK DENSITY	1/200, 1/500	1.95-2.95 gm/cc	3	Backup to extend into track 2.
$\Delta T$	1/200, 1/500	140 - 40	3	140 - 240 Backup to extend into track 2.
CAL	1/200, 1/500	6 – 16"	1	Azimuthal borehole geometry as separate display.

Directional information and pertinent remarks concerning the LWD operation should be included in Track 4.

The log scales above are offered as a guide and can be changed for clarity of data presentation by the Apache Wellsite Geologist in consultation with the Perth office.

- 4.10 Final log copies, film and tapes should be sent to the Head office in Perth as soon as possible. Tapes should be provided at 1600 BPI in LIS format and contain all raw and corrected field data. Tapes and disks carry Apache data labels, have verifications listings provided and have been checked for data integrity before delivery.
- Logs and a provisional copy of the "End of Well Report" for proof reading are to be provided as soon as possible after drilling. Two copies of the final "End of Well Report" (one bound, one unbound) and three copies of logs at 1:200, 1:500 scales (two black line, one sepia) to be provided after completing any amendments requested by Apache.