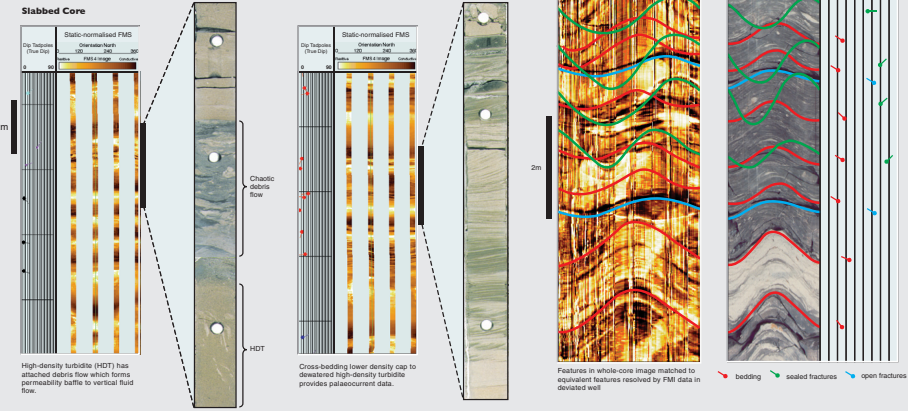


# Borehole Image Interpretation

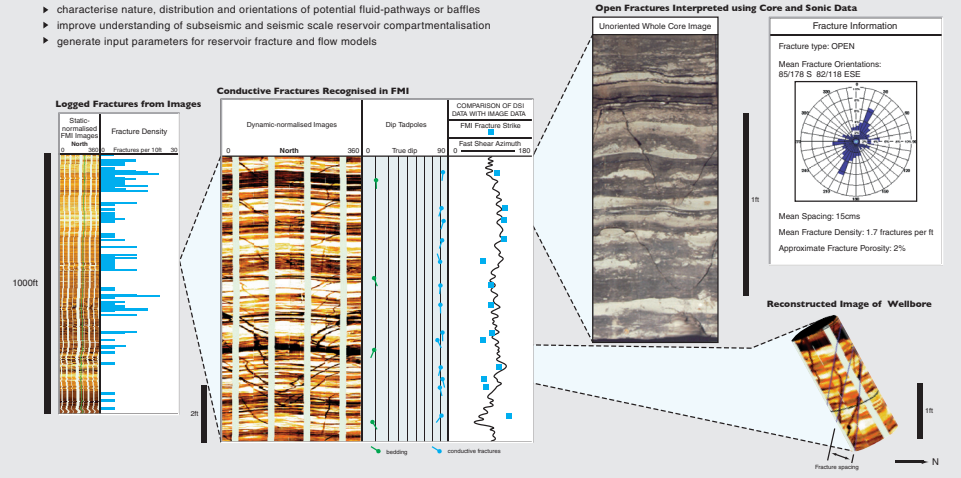
## CORE-TO-IMAGE LOG CALIBRATION

- accurately determine core shifts based upon feature matching
- increase confidence in image facies and fracture recognition
- identify significant surfaces outside of cored intervals
- accurate orientation of whole core images (core goniometry)



## FRACTURE AND FAULT CHARACTERISATION

- characterise nature, distribution and orientations of potential fluid-pathways or baffles
- improve understanding of subseismic and seismic scale reservoir compartmentalisation
- generate input parameters for reservoir fracture and flow models



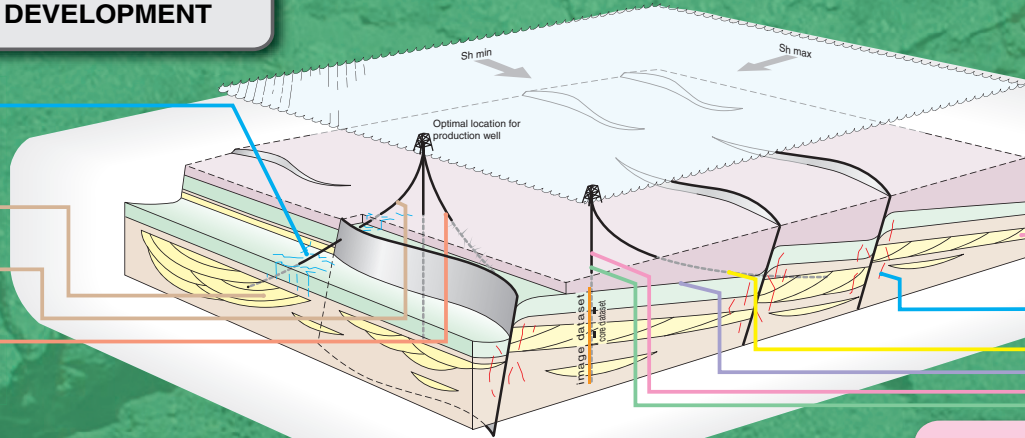
## APPLICATIONS TO RESERVOIR DEVELOPMENT

Enhanced production from open fracture networks. Impact of fractures on fluid flow assessed  
Fracture orientation, distribution and density determined from images

Sandbody locations, geometries and preferential permeability directions constrained by palaeocurrent analysis

Sidetrack this way to target high-quality channelised sandstones

Mechanically stable well trajectory. Frac reservoir to enhance production



Sedimentary image facies analysis provides detailed understanding of reservoir architecture and enables prediction of sandbody locations

Poor production due to high fracture density in damage zone of subseismic-scale fault. Distribution and sealing potential of fractures assessed from images and degree of reservoir compartmentalization determined

Facies types and fracture networks characterised in highly deviated well

Orientation of cap rock constrained from structural dip evaluation

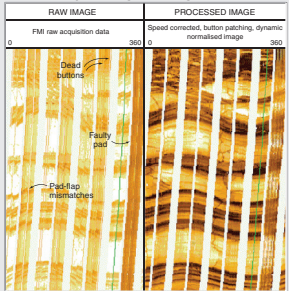
Development well in which reservoir layering is established from images. Image logs provide better reservoir coverage than cored sections

## DATA PROCESSING AND QUALITY CONTROL

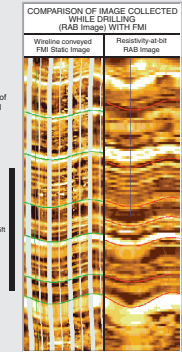
Processing and QC of microresistivity and acoustic tool data (OBMI, EARTH IMAGER, FMS, FMI, ARI, RAB, STAR, CBIL, UBI, ADN and pseudoimages from HDT, HDIP, SHDT, OBDT) involves:

- raw data QC
- speed corrections
- resistivity tool pad-button repairs and correction for variations in the current emitted by the tool
- acoustic tool centralisation corrections
- identification of artifacts and flagging of zones of good/poor quality images

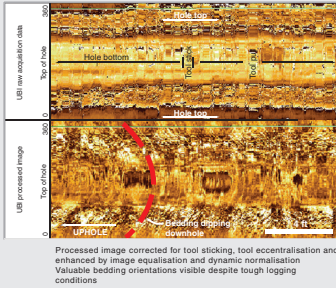
### Microresistivity Tool Image Processing



### LWD (logging while drilling) Image Processing



### Processing of Acoustic Images from a Long-reach 6" Horizontal Well

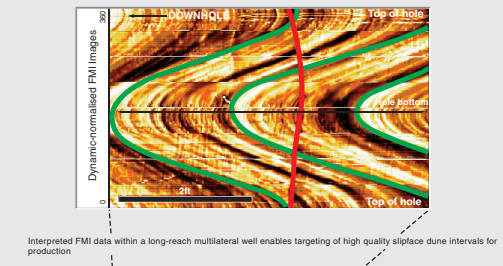


| TOOL TYPES         |   |
|--------------------|---|
| FMS*               | (Formation MicroScanner)                      |
| FMI*               | (Fullbore Formation MicroImager)              |
| ARI*               | (Azimuthal Resistivity Imager)                |
| RAB*               | (Resistivity-at-Bit)                          |
| STAR†              | (Simultaneous Acoustic Resistivity Imager)    |
| CBIL†              | (Circumferential Borehole Image Log)          |
| UBI†               | (Ultrasonic Borehole Imager)                  |
| ADN*               | (Azimuthal Density Neutron)                   |
| Pseudoimages from: |   |
| HDT*               | (High-resolution Dipmeter Tool)               |
| SHDT*              | (Stratigraphic High-resolution Dipmeter Tool) |
| OBDT*              | (Oil-based mud Dipmeter Tool)                 |

\* Mark of Schlumberger † Mark of Western Atlas

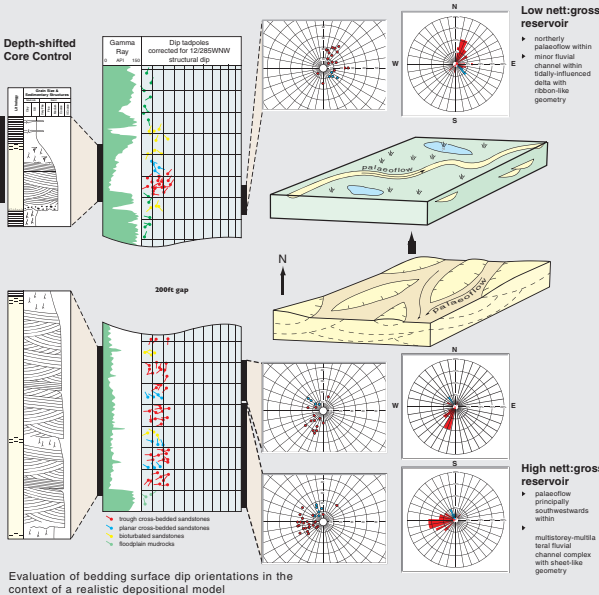
## APPLICATION TO HIGHLY DEVIATED WELLS

- understand lateral facies distribution and sandbody geometries
- greatly improve modelling of fracture networks by providing a cross-sectional sample line



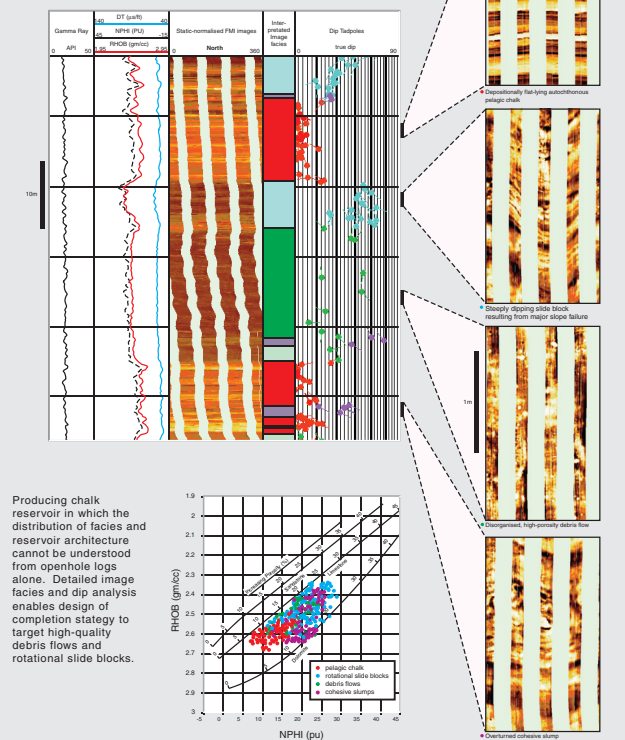
## PALAEOCURRENT CHARACTERISATION

- determine sandbody geometry and palaeoflow direction
- provide orientation directions of preferential fluid-flow pathways



## IMAGE FACIES ANALYSIS AND INTERPRETATION

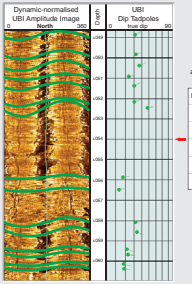
- facies characterisation outside of cored intervals following core calibration
- improve characterisation of reservoir layering and architecture
- refine depositional models



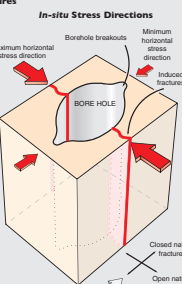
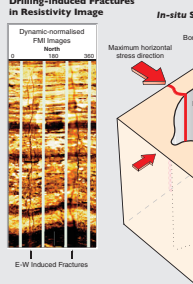
## IN-SITU STRESS ANALYSIS

- accurate characterisation of borehole breakouts and induced fractures (geometry, locations and orientation)
- improve wellbore stability modelling and well planning
- aid Frac-job design
- establish sealing potential of natural fractures

### Borehole Breakouts in Acoustic Image

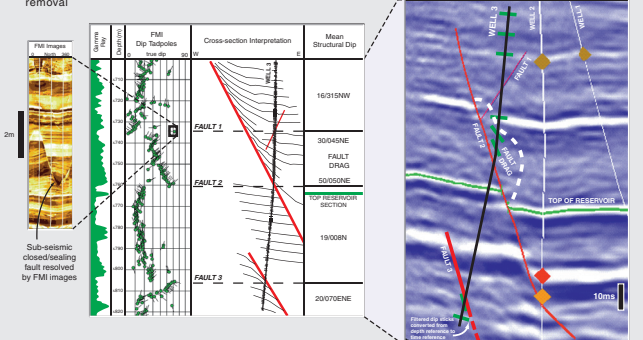


### Drilling-induced Fractures in Resistivity Image



## STRUCTURAL DIP ANALYSIS

- aid sidetrack and future well planning by determining reservoir/cap rock orientation
- define geometry of faults and damage zones (both seismic and sub-seismic scale)
- confirm seismic structural dip interpretation
- characterise palaeotransport directions following structural dip removal



**badley ashton**  
reservoir geoscience

**Badley Ashton & Associates Ltd**  
Winceby House,  
Winceby, Horncastle,  
Lincolnshire, LN9 6PB, United Kingdom  
Tel: +44 (0)1507 588 353, www.badley-ashton.co.uk