Association Round Table

grading sabbha sequence. Correlation of log markers demonstrates con-
siderable bottom topography along prograding clinoform ramps in the
lower Madison and the irregularity of the advancing evaporite complexes
in the upper Madison. Many marker horizons pinch out against the clino-
form slopes or the prograding evaporites, leaving few regionally traceable
markers below the Polar interval. The Madison has a high potential for
multiple reservoir development and for multiple stratigraphic traps where
pinch-outs and lateral gradations occur.

In contrast, log markers in the Bighorn Group extend regionally. The
lithologies represented by the markers are also consistent regionally. Sev-
eral discrete, nonlaterally intergrading events in the upper Bighorn are
marked by sharp transitions upward from burrowed, mud-rich carbonate
through laminated dolomudstone to anhydrite. The regional persistence of
lithofacies, their relatively uniform thickness, and the long distance
correlation of log markers indicates both long and short term deposi-
tional stability over nearly uniform bottom topography. Deposition took
place in a very shallow sea that graded to a carbonate marsh or swamp
environment over the entire Williston basin region. Reservoirs are devel-
oped at consistent stratigraphic horizons, and the possibility of strati-
graphic traps is limited under these conditions.

Just as Madison starved-basin depositional styles in the Williston basin
arisen with Mississippian depositional styles in the Illinois basin and
eastward in North America, Ordovician depositional styles, repre-
senting shallow stable conditions, extended across the Transcontinental
arch into the Illinois basin and elsewhere. Contrasting styles of sedimen-
tation and reservoir development in the same basin at different times
require different exploration strategies. These contrasts must be consid-
ered when developing multiple objective programs.

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and Gas Corp., Tulsa, OK

Walker Lake, Nevada: Sedimentation in an Active, Strike-Slip Related Basin

Walker Lake, Nevada, is in an active fault-controlled basin related to
the right-lateral, northwest-trending Walker Lake Shear Zone on the
western side of the Basin and Range province. The lake occurs in a half
graben bounded on its west side by a high-angle normal fault: zone along
the Wassuk Range front. This fault zone may merge to the north into the
Walker Lake fault system, which forms the northwest boundary of the
basin. To the south of Walker Lake, the Wassuk front fault merges with
an east-northeast trending left-lateral fault. The Walker Lake basin is
interpreted to be a pull-apart basin formed within the triangular zone
bounded by the Wassuk front, Walker Lane, and left-lateral faults. The
Walker River drainage basin occupies about 10,000 km² (3,800
mi²) in western Nevada and parts of California and is essentially a closed
hydrologic system that drains from the crest of the Sierra Nevada in Cali-
ifornia and terminates in Walker Lake. Walker Lake trends north-
northwest and is 27.4 km (17 mi) long and 8 km (5 mi) wide with water
depths exceeding 30 m (100 ft). Lake Lahonton (Wascomuian) shorelines
ring Walker Lake and suggest water depths of 150 m (500 ft) above the
present lake level. The lake is situated in an asymmetric basin with steep
alluvial fans flanking the western shoreline (Wassuk Range) and gentle,
areally more extensive fans flanking the eastern shoreline (Gillis Range).
The Walker River delta enters the lake from the north and is a major sedi-
mant source for the basin. Older dissected shoreline, alluvial fan, Gilbert
delta, and beach ridge deposits were built largely of coarse-
gained, locally derived materials. Stromatolites, oncokes, and tuflas
formed along the shorelines, whereas mud and organic sediments accu-
mulated in the lake on the west side of the basin. Extensive submerged
sand flats and local sand dunes occur on the east side of the basin.

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Tectonic Evolution of Sevier-Laramide Foreland Structures from Latest
Jurassic Through the Eocene

Sevier-Laramide overthrusting was generated by both relative North
American (NA)-Farallon and absolute NA plate motions. The magnatic
arc thermal axis (MAT), adjacent thermally weakened hinterland meta-
morphic "core" (HMC), and mechanical anisotropies in the upper crust
contributed to variations in thrust belt development. Latest Jurassic to
earliest Cretaceous west-northwest-directed absolute motion of NA plate
collapsed the Cordillera toward the east-southeast, causing southeast to
east vergent thrusting along the hinterland and Sevier thrust belt. Relative
NA-Farallon and absolute NA plate motions increased dramatically in
the mid-Cretaceous between 105 and 85 m.y.B.P. causing the MATA-
HMC to migrate eastward. Rapid west-northwest absolute motion of NA
collapsed the Cordillera toward the east-southeast, causing major south-
west to east vergent thrusting along the Sevier thrust belt.

Absolute NA motion slowed after 85 m.y.B.P., but increasing relative NA-Farallon
motion forced shallowing of Farallon subduction angle and further east-
ward migration of the MATA-HMC. This allowed relative plate conver-
gence stresses to be transferred into the Laramide foreland (LF). Latest
Cretaceous-Paleocene (72-56 m.y.B.P.) rapid (13 cm/yr, 5 in./yr), east-
northeast-directed NA-Farallon plate convergence created northwest to
north-trending, southwest to east or west vergent overthrusting and west-
northwest-trending sinistral faulting in the LF from southern Arizona to
northern Montana. Extremely rapid (15 cm/yr, 6 in./yr), north-
northeast-directed NA-Farallon plate convergence in the Eocene (56-43
m.y.B.P.) generated intense northwest-trending, southwest vergent over-
thrusting in southern Arizona, north-trending dextral faulting in the
northern LF; and east-west-northeast to south vergent overthrusting in
the northern LF.

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Dedolomitization, Dolomitization, and Chertification in Fort Payne
Formation: Relative Timing and Mechanism

Samples of the Fort Payne Formation (Lower Mississippian) of central
Tennessee typically contain 50% or more chert, with the bulk of the bal-
ance consisting of replacive dolomite. Low-iron calcite and ferroan cal-
cite are common and minor ankerite is also present. The relative sequence
of diagenetic replacement was established by cross-cutting relations as:
low-iron calcite replaced by chert replaced by dolomite, introduction
of ankerite, and finally, replacement by ferroan calcite of both chert and
dolomite (dedolomitization). Thus dedolomitization was the last diagen-
etic phase. Complete replacement, rim replacement, and replacement of
cores of dolomite rhombs by ferroan calcite was observed. Ferroan cal-
cite fills veins, vugs, and intergranular pores and replaces sponge spi-
cules. Dedolomite occurs in both surface and subsurface samples, and
there is no evidence for an unconformity within or adjacent to the Fort
Payne, suggesting that the dedolomite is not related to exhumation and
weathering. Minor mineralogy and sedimentary structures suggest a sub-
tidal shelf, quiet-water environment of deposition. Stratigraphic rela-
tions suggest shallow burial. Dedolomitization of the Fort Payne
occurred after lithification, probably during shallow burial, when ferroan
iron was derived from indigenous minerals.

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ing, Inc., Sacramento, CA

A Microcomputer-Based Borehole Engineering System

This paper describes a microcomputer system designed to take raw
drilling data combined with measured rock properties such as porosity
and permeability to produce output in the form of depth plots. User-
selected parameters include porosity, permeability, formation pressures
such as pore, fracture, or overburden, rock properties such as Poisson’s
ratio or bulk modules, and bottomhole and formation temperatures.

Data entry can be done via multiplexor from a data gathering system,
through a data communication link, or by manual input. The system
allows either raw or partially processed data to be supplied, and can be
run either online in real time at the wellsite or offline at a remote location.

The data is processed sequentially by the system, with each calculation
or processing module performing a specific operation on the data. The
calculation modules used for any data set are selected by the user from a
base menu. These modules can be removed, added or changed as desired
by the client or operator, allowing easy tailoring and expansion of the sys-
tem.

Output from the system goes to disk for storage and to a drum plotter.
This enables continuous monitoring of the borehole parameters as the
well is drilled, and enhances the value of the data.