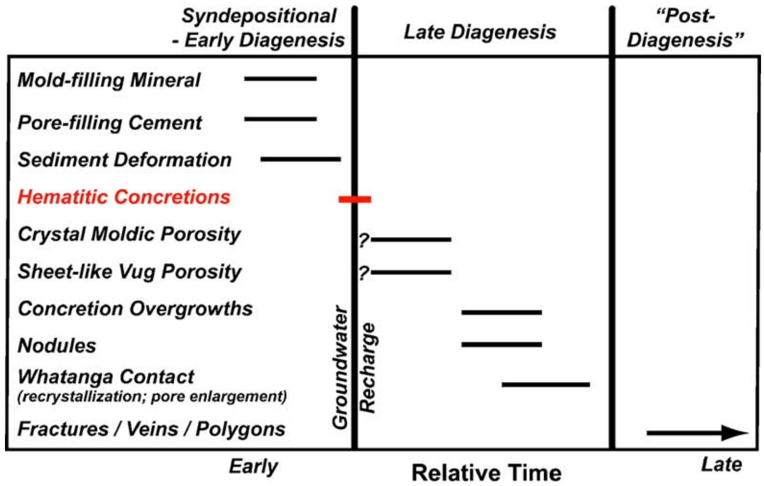

Fig. 4. Schematic diagram showing the relative timing of diagenetic features observed in the Burns formation. The boundary between early and late digenesis is arbitrarily set at the formation of the concretions because this was likely a relatively rapid event associated with a chemically distinct groundwater recharge event. See text for further discussion.

vasive as to obscure or significantly disrupt primary sedimentary fabrics (i.e., bedding, lamination, cross bedding, ripple forms). *Opportunity* imaged a variety of textures, including cements, concretions, nodules and secondary porosity that formed after deposition, and are clearly diagenetic. The inferred order of these features is summarized in Fig. 4 and Table 2.

5.1. Cements

At least two and possibly four generations of cement are present within these rocks (Fig. 5). The mineralogy of cements is not constrained but inferred to be one or more of the possible evaporitic mineral jarosites, Mg-sulfate, Ca-sulfate, other Fe-sulfates, chlorides ± hema-

Table 2
Proposed geologic history of the Burns formation (oldest to youngest)

Depositional Stage	Event
PRE-DEPOSITIONAL *(Playa Lake Facies)*	1. Deposition and evaporative cementation of basaltic mud, likely near margin of playa lake. Erosion to produce sand-sized grains.
DEPOSITIONAL *(Dune-Sand Sheet-Interdune Facies)*	2. Aeolian transport of impure evaporitic sand grains within dune - sand sheet - interdune depositional environment under a range of dry to wet conditions. Periodic rise of groundwater table results in shallow subaqueous conditions in interdune setting [2].
DIAGENETIC *(Related to syndepositional evaporation and fluctuating groundwater table)*	3. Syndepositional formation of small (mm-scale) cross-cutting crystals of an evaporite mineral more soluble than Mg-sulfates likely during evaporation of near-surface water table or capillary fringe of water table.
	4. Syndepositional to very early diagenetic formation of fine-grained (<100 μm) cement filling primary porosity, likely caused by evaporation of near-surface water table or capillary fringe of water table.
	5. Rapid formation of hematitic concretions likely during a chemically distinct groundwater recharge event. A thermodynamically plausible model is that hematite (or hematite precursor) forms by the breakdown of jarosite or other iron sulfate such as melanterite.
	6. Formation of secondary porosity by dissolution of small tabular crystals (crystal molds) and dissolution of earlier cements to form elongate to sheet-like vugs. Possible that the secondary porosity forms as a result of concretion growth.
	7. Formation of overgrowth cements around concretions under fluid-saturated conditions. In the lower and middle units (dune, lower part of sand sheet facies), this cement is more abundant and forms at nucleation sites in addition to concretions. Contact between the middle and upper units, interpreted to be a diagenetic front, is marked by a dark colored zone where primary stratification is obscured by recrystallization and secondary porosity is especially abundant.
"POST-DIAGENETIC" *(Impact, karsting(?), erosion)*	8. Formation of fractures, fracture fillings, veins and polygonal features likely associated with impact processes. May also involve very late diagenetic processes, such as karsting.
	9. Erosion of units above outcrop to produce lag of concretions on plains.