

3-D Stratigraphic Correlation of Shallow, Densely Spaced Cores from the Jurassic Lower Portland Formation in the Hartford Basin (Hartford, CT)

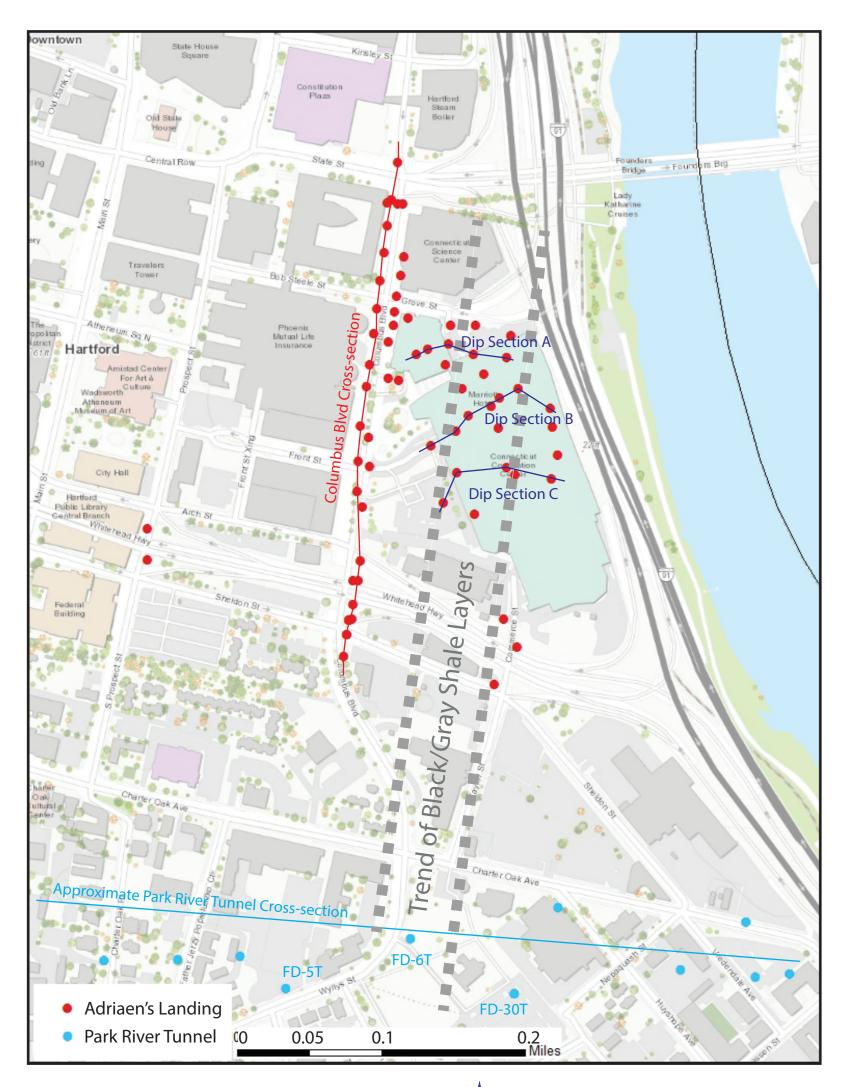


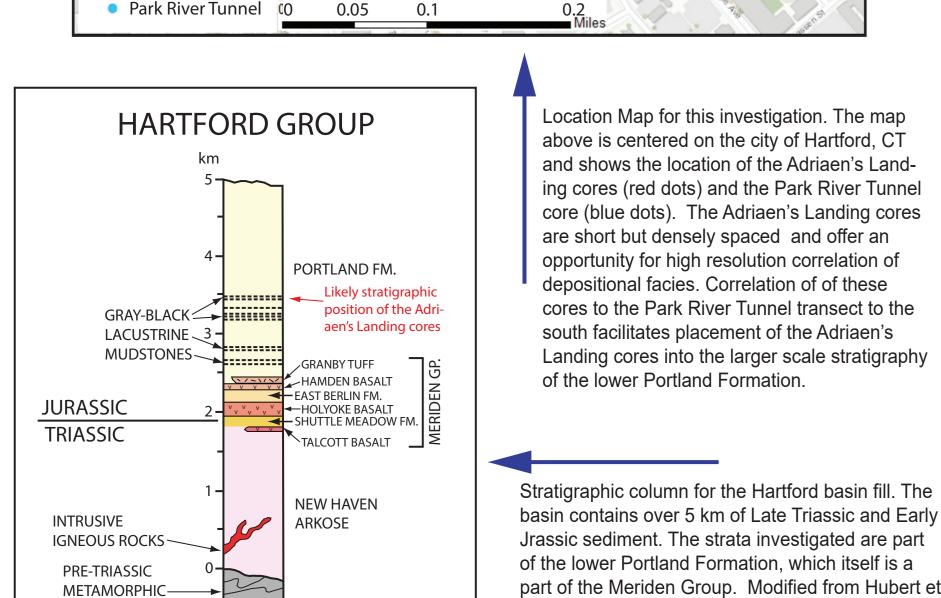
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1. SUMMARY

The lower Portland Formation (Jurassic) of the Hartford Basin is composed of mudstone-rich lake and dry lake facies with lesser amounts of river sandstone deposited in a rift basin associated with the breakup of Pangaea. 71 closely spaced bedrock cores drilled in the Adriaen's Landing region of downtown Hartford, CT, provide a unique opportunity to examine 3-D stratal relationships within the lower Portland Fm. These cores are typically short (1.5-3m, with a few up to 14m) but densely spaced (30-50m from neighboring boreholes). We first produced a 520m long, N-S strike-parallel transect of 19 cores located along Columbus Blvd in Hartford. Most of the cores in this crosssection contain a bed with light-colored carbonate nodules making the correlation robust. Thus, it is possible to characterize along-strike variations in the dimensions of stratigraphic elements, such as the width of channels. Even though the wells are closely spaced, the short interval drilled for most wells makes 3-D correlation challenging. Fortunately, two distinct trends of black shale lake beds prove useful for developing a 3-D framework. Finally, the Adreian's Landing cores were correlated with the older, better studied transect of Park River cores located 330m south of the Columbus Blvd section, in order to place the cores within a long-term stratigraphic framework. Sedimentary structures, notably carbonate nodules within gray shale, suggest the two lake intervals identified with the Adriaen's Landing cores correlate to the 1st and 2nd lake beds down from the top of the 500+ meter Park River composite stratigraphic column.

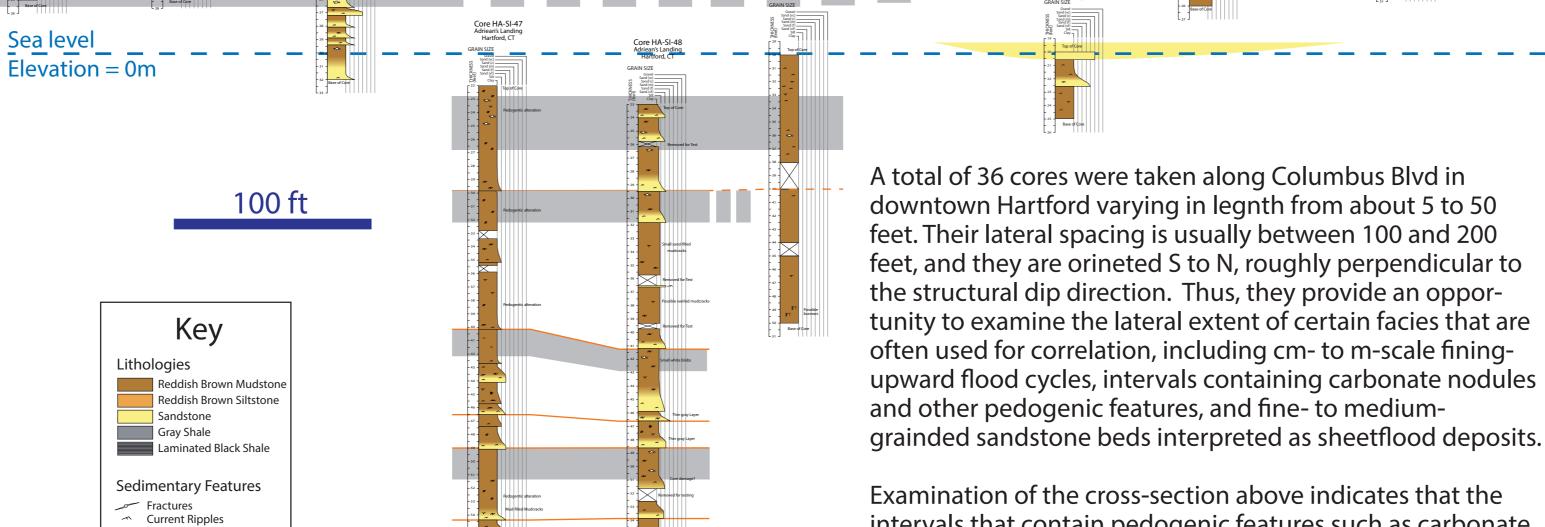
2. GEOLOGICAL BACKGROUND





Densely spaced cores taken in downtown Hartford, CT as part of the Adriaen's Landing construction project (2000's) provide a unique opportunity to investigate the detailed 3-D distribution of depositional facies of the lacustrine lower Portland Formation, a stratigraphic interval that is not well exposed in the Hartford Basin. Their close proximity to the older Park River Tunnel cores (1970's) allow these observations to be placed within the larger-scale basin sedimentary fill.

3. COLUMBUS BLVD (ALONG STRIKE) CORRELATION



intervals that contain pedogenic features such as carbonate nodules (gray layers) can be traced over lateral distances of 1000 feet or more. Flood cycles (orange lines) and sheetflood deposits (yellow intervals) are more restricted in extent, and can usually be traced only between a few nighboring cores. This is interpreted to be related to the actual dimensions of the sheetflood beds, but in regard to the flood cycles, it may reflect recognition problems associated with the subtle lithologic variations that record these cycles.

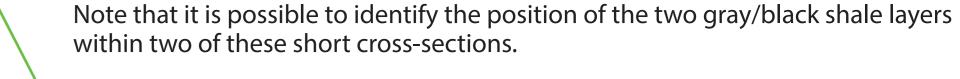
2) were constructed to examine the 3-D distribution of facies. However, the short (5-10 ft) length of cores, and the 15 degree structural dip, result in a lack of overlap between adjacent cores, despite their close proximity. In these CORRELATIONS cross-sections, the green lines show the projection of the tops of cores toward neighboring cores accounting for the structural dip and the vertical exaggeration. Dip Section A

Intervals with carbonate nodules and pedogenic structures

Base of fining-upward flood cycles

Sheetflood Sandstones

Facies Correlations:



Carbonate silt lens

Three short cross-sections taken parallel to the direction of dip (see map in panel



Typical Flood Cycle

Pedogenically altered mudstone with mudcracks

and carbonate nodules

Planar Bedding

Burrows Bioturbation

Rip-up Clasts

Evaporite Minerals

∽ Nodules# Pedogenic structures

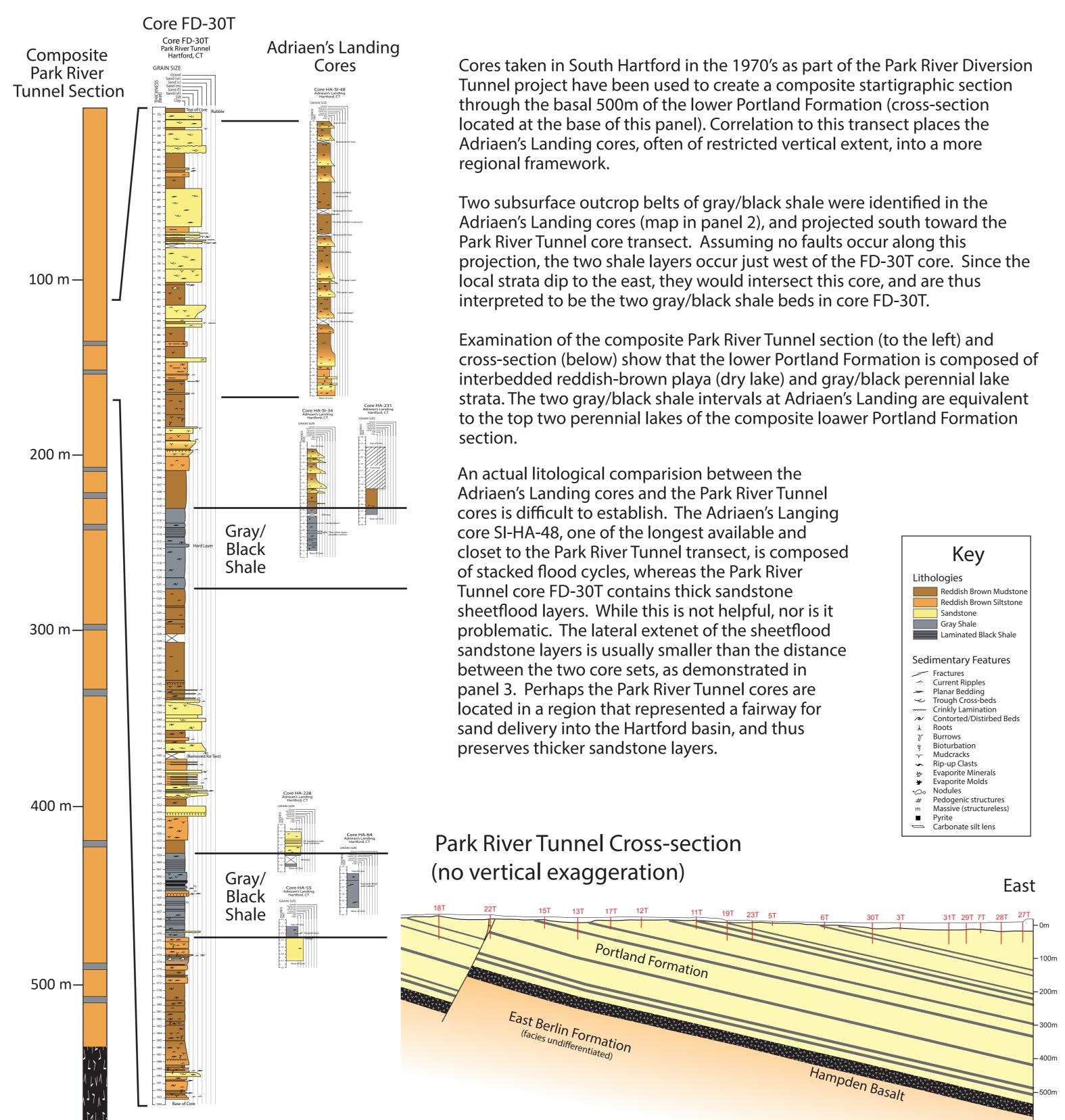
m Massive (structureless) Pyrite
Carbonate silt lens

Evaporite Molds

Trough Cross-beds

Crinkly Lamination

Contorted/Distirbed Bed



Dip Section B East Dip Section C

Reddish Brown Siltstone Gray Shale ************* Sedimentary Features Fractures Current Ripples Planar Bedding Trough Cross-bed ····· Crinkly Lamination Contorted/Distirbed Bed Burrows Bioturbation Bi Mudcracks ✓ Rip-up Clasts№ Evaporite Minerals₩ Evaporite Molds 100 ft # Pedogenic structures m Massive (structureless)

6. CONCLUSIONS

Facies Correlations:

Tops of cores

IBlack/gray shale beds

- . The Adriaen's Landing cores provide a dense, 3-D dataset for examining the facies distribution of the basal part of the Lower Jurassic Portland Formation. There are 71 cores, typically 5-20 feet in length, with two approaching 50 feet.
- 2. A long transect perpendicular to the dip direction along Columbus Blvd in downtown Hartford demonstrates the usefulness of mudstone intervals containing pedogenic alteration, such as carbonate nodules, to correlate strata over long distances. Sheetflood sandstone beds and flood cycles are less useful.
- Despite the close proximity of the cores, their short length, coupled with the 15 degree structural dip, do not allow dip-parallel correlation of strata as there is no stratigraphic overlap between adjacent cores.
- . Two gray/black shale intervals mapped within the Adriaen's Landing area have been correlated to the top two gray/black shale beds of the composite lower Portland Formation derived from the Park River Tunnel cores drilled in the 1970's.