Figure F1. Area map, Site C0024. Donet = Dense Oceanfloor Network System for Earthquakes and Tsunamis, ROV = remotely operated vehicle. Black dots = Expedition 314 and 316 sites, white dots = Expedition 358 logging-while-drilling and coring holes.

Figure F2. Interpreted seismic depth section of In-line (IL) 2437 in frontal thrust region with locations of Sites C0024, C0006, and C0007. XL = cross-line. Colored shading = seismic stratigraphic packages, red = faults (bold for major faults), yellow = Site C0024 logging-while-drilling and coring holes.

Figure F3. Composite stratigraphic column, Site C0024. Key applies to both unlithified and indurated equivalents of comparable lithology.

Figure F4. Lithologic Unit I and II stratigraphic columns, Site C0024. Correlation between Holes C0024D and C0024G is based on matching a distinctive bed of volcanic ash (star). Key applies to unlithified lithologies.

Figure F5. Typical Unit II lithologies, Holes C0024D and C0024G. A. Mottled silty clay to clayey silt with pumice clasts. B. Graded beds of fine to very fine sand and very fine sand to silt separated by structureless silty clay. C. Graded volcanic ash with irregular base (dark gray to pink) and structureless silt-sized volcanic ash (dark pink to orange). Lower ash layer was used to correlate between Holes C0024D and C0024G. D. Ash layer (dark pink to orange) used to correlate between Holes C0024D and C0024G.

Figure F6. Typical Unit II lithologies, Hole C0024G. A. Silt and very fine sand with interbeds of light gray silty clay. B. Patch of organic matter in very fine sand. C. Medium to very coarse sand with granules. D. Silt layer with parallel and low-angle cross-lamination.

Figure F7. Granules in very coarse sand in Unit II (358-C0024G-18X-5, 64–70 cm). See Figure F6C for core photograph. A. Granite. B, C. Diorite. D. Andesite. E, F. Basalt. G–I. Andesitic to basaltic volcanic rock. J. Metamorphic rock. K. Mudstone. L. Sandstone or volcaniclastic rock. M. Vein quartz or quartzite. N. Red chert.

Figure F8. Representative Unit II lithologies (left: plane-polarized light [PPL], right: cross-polarized light [XPL]), Hole C0024D. A. Silty clay. B. Sandy silt. C. Silty sand. D. Volcanic ash.

Figure F9. Representative Unit II lithologies (left: PPL, right: XPL), Holes C0024E and C0024G. A. Silty clay. B. Silty sand. C. Sand. D. Volcanic ash.

Figure F10. Statistical analysis of event bed frequency (turbidites and volcanic ash) for Unit II, Site C0024. A. Compilation of event bed distribution. Black dots = cumulative thickness of sand/silt beds. B. Histogram of turbidite bed thickness distribution. C. *T* (bed thickness) vs. *N* > *T*. See EVENTBED in Supplementary material for tabulated results.

Figure F11. X-ray fluorescence chemical compositions from bulk fine-grained sediments from Units I and II, Site C0024. See Table T5 for tabulated results. LOI = loss on ignition.

Figure F12. Random bulk powder X-ray diffraction mineral composition from sediments from Units I and II, Site C0024. See Table T6 for tabulated results. Values from facies-equivalent trench-slope deposits at Sites C0006 and C0007 are also shown (Expedition 316 Scientists, 2009a, 2009b). Note that facies are not age correlative among the sites. Lithology key applies to unlithified sediment.

Figure F13. Lithologic Unit III and IV stratigraphic column, Hole C0024E. Lithology key applies to lithified sediment.

Figure F14. Typical Unit III facies, Hole C0024E. A. Structureless silty claystone to clayey siltstone associated with unidentified forms of bioturbation. B. Structureless bioturbated silty claystone with interval of graded siltstone. C. Thin-bedded, fine-grained turbidites with erosive base and diffuse lamination. D. Light gray thin-bedded tuff (lithified ash).

Figure F15. Representative Unit III lithologies (left: PPL, right: XPL), Hole C0024E. A. Silty claystone. B. Clayey siltstone. C. Silty sandstone. D. Volcanic ash/tuff.

Figure F16. X-ray fluorescence chemical compositions from bulk silty claystone, Hole C0024E. See Table T5 for tabulated results. LOI = loss on ignition.

Figure F17. Random bulk powder X-ray diffraction mineral composition from silty claystone from Units III and IV, Hole C0024E. See Table T6 for tabulated results. Lithology key applies to lithified sediment.

Figure F18. Typical Unit IV facies, Hole C0024E. A. Dark green bands and patches observed in silty claystone to clayey siltstone. B. *Zoophycos* bioturbation. C. Pyrite nodule associated with mottled texture in silty claystone to clayey siltstone. D. Mottled silty claystone to clay siltstone with scattered foraminifers.

Figure F19. Representative Unit IV lithologies (left: PPL, right: XPL), Hole C0024E. A. Silty clay. B. Silty clay mixed with volcanic ash. C. Silty clay and abundant biogenic carbonate fragments. D. Volcanic ash.

Figure F20. Compilation of bulk powder X-ray diffraction data from Units III and IV, Site C0024. Results from equivalent facies at Sites C0006 and C0007 in frontal accretionary prism are also shown (Expedition 316 Scientists, 2009a, 2009b). Depths for data from Sites C0006 and C0007 have been adjusted to a common position of the Unit III/IV boundary (555 mbsf in Hole C0024E, 449 mbsf at Site C0006, and 362 mbsf at Site C0007). Note that ages are not correlative between sites.

Figure F21. Overview of (A) deformation bands, sediment-filled veins, and minor faults and (B) shear zones observed in cores, Site C0024.

Figure F22. Dip data of (A) bedding and (B) deformation structures, Site C0024.

Figure F23. Lower hemisphere equal-area projections of poles to bedding, faults, and deformation bands, which have been corrected for drilling-induced rotation using shipboard paleomagnetic data. A. Bedding, Holes C0024B and C0024D. B. Bedding, Holes C0024G and C0024E. C. Deformation bands, Hole C0024E. D. Faults, Hole C0024D. E. Faults, Hole C0024E.

Figure F24. Examples of deformation bands, Hole C0024E. A. Low-angle deformation band (arrow). B. High-angle deformation band with apparent reverse sense of offset.

Figure F25. A, B. Deformation band (358-C0024E-2R-2; A: PPL; B: XPL). The feature, several millimeters wide, is composed of several thinner bands of compacted material. High birefringence colors in B indicate concentration of phyllosilicates in the bands, illustrated at higher magnification in C and D.

Figure F26. Example of array of sediment-filled veins, Hole C0024E. Features are ~1 mm wide and contain darker material than host sediment. They are constrained to a particular section of the core and have a sigmoidal appearance. Some offsets are apparent on some of the veins.

Figure F27. Detail of one sediment-filled vein (XPL). Features appear to contain higher proportion of phyllosilicates as indicated by high birefringence colors. Some localization in the veins is evident, giving a similar appearance on the microscopic scale to the deformation bands (cf. Figure F25C).

Figure F28. Example of high-angle normal faults, Hole C0024D. Yellow arrows = traces of fault planes. A. X-ray computed tomography (CT) image parallel to split core surface. B. Split core surface. MSCLI = photo image logger.

Figure F29. Example of shallow fault with undetermined displacement, Hole C0024D. Yellow arrows = potential trace of fault plane. A. X-ray computed tomography (CT) image perpendicular to split core surface. B. X-ray CT image parallel to split core surface C. Split core surface. MSCLI = photo image logger.

Figure F30. Examples of deformation structures observed, Hole C0024E. A. Cohesive high-angle fault. B. Cohesive faults (red arrows) with minor offset (yellow arrows). C. Apparent cohesive thrust fault (red arrows), offsetting *Zoophycos* burrow. D. Cohesive fault (red arrows), the slip sense of which is undetermined. E. Apparent thrust fault (red arrows), offsetting *Zoophycos* burrow. F. Close-up showing stepped fault striae with a left-lateral sense of slip.

Figure F31. Shear zone at 295.2–295.3 mbsf (358-C0024G-22X-4, 40–47 cm). A. Sigmoidal sand clasts indicating a reverse sense of shear and dark band at base of shear zone. B. Sketch highlighting key shear zone features. C. False-color X-ray computed tomography image of shear zone illustrating that no strong density difference occurs across the zone, although an apparently higher density is evident within the shear zone.

Figure F32. Example of cracks and voids potentially related to degassing during core recovery, Hole C0024G. A. X-ray computed tomography (CT) image parallel to split core surface. B. Split core surface. MSCLI = photo image logger.

Figure F33. Vector endpoint and stereonet magnetization directions showing alternating field demagnetization results, Hole C0024B. NRM = natural remanent magnetization. Demag. = demagnetization, Dec. = declination, Inc. = inclination, Int. = intensity.

Figure F34. Remanent magnetization before (red) and after (blue) 20 mT alternating field demagnetization (0–60 mbsf), Holes C0024B–C0024D. Small open triangles = archive halves, large yellow triangles = discrete samples.

Figure F35. Remanent magnetization before (red) and after (blue) 20 mT alternating field demagnetization (60–200 mbsf), Holes C0024D and C0024G. Small open triangles = archive halves, large yellow triangles = discrete samples.

Figure F36. Remanent magnetization before (red) and after (blue) 20 mT alternating field demagnetization (200–330 mbsf), Hole C0024G. Small open triangles = archive halves, large yellow triangles = discrete samples.

Figure F37. Remanent magnetization before (red) and after (blue) 20 mT alternating field demagnetization (500–660 mbsf), Hole C0024E. Small open triangles = archive halves, large yellow triangles = discrete samples.

Figure F38. Downhole variation in inclination and inferred magnetic polarity, Holes C0024B–C0024E and C0024G. Small open triangles = archive halves, large yellow triangles = discrete samples. Polarity: black = normal, white = reversed, gray = mixed.

Figure F39. Histogram of archive-half inclinations, Holes C0024B–C0024E and C0024G.

Figure F40. Salinity, pH/pmH, alkalinity, sulfate, chlorinity, bromide, ammonium, and phosphate, Site C0024. Black arrows = seawater (SW) concentrations.

Figure F41. Minor elements boron, lithium, strontium, barium, iron, manganese, and silica, Site C0024.

Figure F42. Major elements sodium, potassium, magnesium, and calcium, Site C0024. Black arrows = seawater (SW) concentrations.

Figure F43. Trace elements vanadium, copper, zinc, arsenic, rubidium, molybdenum, cesium, lead, and uranium, Site C0024.

Figure F44. Headspace (HS) and void space (VAC) gases, Site C0024.

Figure F45. Calcium carbonate, total organic carbon (TOC), total sulfur (TS), total nitrogen (TN), and TOC/TN ratio, Site C0024.

Figure F46. Whole-round multisensor core logger measurements, Site C0024. GRA = gamma ray attenuation, NGR = natural gamma radiation. cps = counts per second.

Figure F47. *P*-wave measurements from whole-round multisensor core logger, Site C0024. Red = data with *P*-wave amplitude greater than 100 mV.

Figure F48. Moisture and density measurements on discrete core samples, Site C0024.

Figure F49. Electrical resistivity, electrical resistivity anisotropy, *P*-wave velocity, and *P*-wave velocity anisotropy, Site C0024.

Figure F50. Porosity vs. electrical resistivity, Site C0024.

Figure F51. Thermal conductivity, Site C0024.

Figure F52. Thermal conductivity vs. porosity, Holes C0024B and C0024D–C0024G and Sites C0006 and C0011. Dashed and solid lines represent theoretical values for different grain thermal conductivity (k_s) based on geometrical mean mixing model.

Figure F53. Undrained shear strength measurements, Site C0024.

Figure F54. Representative anelastic strain recovery results, Hole C0024E. A. Sample with strain gauges attached. B. Magnitude of normal anelastic strains and temperature vs. elapsed time. C. Magnitude of three principal anelastic strains and mean strain vs. elapsed time.

Figure F55. Advanced piston corer temperature tool measurements at (A) 6.0, (B) 20.5, and (C) 36.0 mbsf, Site C0024. Unshaded area = time interval of temperature data used for equilibrium temperature fit, pink line = fitted theoretical equilibrium curve, triangle = beginning of fit, inverted triangle = end of fit, dashed pink lines drawn with temperature values = estimated equilibrium temperature.

Figure F56. In situ temperature estimated from advanced piston corer temperature tool measurements, Site C0024. Dashed line = best linear fit with depth, suggesting a thermal gradient of 74°C/km.

Figure F57. Temperature as a function of thermal resistance, Site C0024.

Figure F58. Identification of seafloor at 3870 m BRT using gamma ray and resistivity logs, Hole C0024A. P16H/P28H/P40H = 2 MHz phase shift resistivity at 16, 28, and 40 inch spacing, A16H/A28H/A40H = 2 MHz attenuation resistivity at 16, 28, and 40 inch spacing.

Figure F59. Drilling parameters, Hole C0024A.

Figure F60. Hole deviation calculated from deviation surveys listed in Table T20. A. Perspective view from southeast. B. Top view illustrating how the well straddles multiple lines of the 3-D seismic grid. Color scale represents borehole size estimated by e-caliper calculated from MicroScope image data.

Figure F61. Summary of logs recorded, Hole C0024A. Hole size (e-caliper) was calculated shipboard from arcVISION data and by Schlumberger from MicroScope data. Log V_P is from SonicScope; interval velocity is from vertical seismic profile. P16H/P40H = 2 MHz phase shift resistivity at 16 and 40 inch

spacing, A40H = 2 MHz attenuation resistivity at 40 inch spacing. RAB = resistivity-at-the-bit.

Figure F62. Overview of MicroScope resistivity images, Hole C0024A. Static images are scaled by global resistivity distribution for entire logged interval. Dynamic images enhance local contrasts.

Figure F63. Summary of SonicScope data, Hole C0024A. Waveforms are raw data recorded by 12 receivers. Only the first receiver is shown. Reliable wave arrivals are indicated by high coherence across receiver array (brighter colors) calculated from waveforms. Black curves = estimated Hole C0024A V_P and V_S, white curve = interval velocity derived from vertical seismic profile (VSP). LF = low frequency.

Figure F64. Crossplot of bit resistivity and V_P, Hole C0024A.

Figure F65. Picks of bedding attitude and fracture orientations from high-resolution resistivity images, Hole C0024A. RAB = resistivity-at-the-bit.

Figure F66. Logs from 800 mbsf to total depth, Hole C0024A. Faults are illustrated by ultrahigh-resolution image (UHRI). GR = gamma ray. Resistivity buttons: BX = extradeep, BD = deep, BM = medium, BS = shallow.

Figure F67. Depth profiles of breakout azimuths and widths, Hole C0024A. RAB = resistivity-at-the-bit.

Figure F68. Estimation of formation porosity and density using 2 MHz attenuation resistivity at 40 inch spacing log (A40L) and Archie's law, Hole C0024A. R_w = pore water resistivity calculated from salinity and temperature gradient. Gray dots = shipboard measurements on cores. MAD = moisture and density.

Figure F69. Comparison between gamma ray, porosity, and density estimated from Hole C0024A logs and measured on core recovered in Holes C0024D and C0024G. Porosity and density log data were derived from 2 MHz attenuation resistivity at 40 inch spacing log (A40L). c/s = counts per second. NGR = natural gamma radiation, GRA = gamma ray attenuation. Green lines = logging data. A. All data at measured depth. B. Hole C0024D and C0024G moisture and density (MAD) data are shifted down 7 and 12 m, respectively, to compensate for offset between holes.

Figure F70. Comparison between Hole C0024A high-resolution resistivity-at-the-bit (RAB) images and Hole C0024G core images in similar intervals taking into account apparent depth offset observed between holes.

Figure F71. Vertical seismic profile (VSP) results, Hole C0024A. A. Traces recorded by hydrophone at each station. Each trace was produced by stacking ~10 shots. B. Time to depth relationship, Site C0024. Black dots = time calculated from one-way VSP traveltime, green line = velocity model from seismic depth migration, blue line = relationship integrated from sonic log, red dots = tie points used to match synthetic seismogram with In-line 2437 (Figure F72). C. V_P, Site C0024. Black = interval velocity estimated from VSP, blue = sonic log data, green = modeled velocity from seismic depth migration.

Figure F72. Comparison of synthetic seismogram calculated from Hole C0024A logs with other logging data (referenced to depth) and In-line 2437 (referenced to two-way traveltime). Black lines tie Logging Units 1a–2b (in depth) to seismic data (in time), color-coded lines tie time seismic data (Seismic Units A1–D2) to logs. HR = high resolution, RAB = resistivity-at-the-bit, VSP = vertical seismic profile, CDP = common depth point.

Figure F73. Comparison of corridor stack generated from traces recorded during vertical seismic profile (VSP) survey, Hole C0024A. Separation of downgoing and upgoing wavefields allows imaging of reflectors far below depth of hole to ~8 s two-way traveltime. CDP = common depth point.