Supplement containing data and interpretations for the following paper in

BULLETIN OF THE SEISMOLOGICAL SOCIETY OF AMERICA:

Multiple large earthquakes in the past 1500 years on a fault in metropolitan Manila, The Philippines

by

Alan R. Nelson
Stephen F. Personius

U.S. Geological Survey
Geologic Hazards Team
MS 966, PO Box 25046
Denver, CO 80225

and

Rolly E. Rimando
Raymundo S. Punongbayan
Norman M. Tuñgol
Hannah M. Mirabueno
Ariel S. Rasdas

Philippine Institute of
Volcanology and Seismology
University of The Philippines Campus
Diliman, Quezon City, The Philippines

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Part 1. This part includes the logs of trenches and exposures at the Maislap site, which are presented in a series of figures (S2 through S12). Figure S1 explains the symbols and labels used on the figures. An explanation of the siting of the trenches precedes the figures and additional comments about each exposure are included in the captions, which appear beneath each figure.

Part 2. This part consists of five tables (Tables S1 through S5) of lithologic data for stratigraphic units on Figs. S2 through S12. Unit labels on the tables correspond with those on the figures.

Part 3. This part consists of a description and interpretation of the stratigraphy in the southwest wall of trench 1 (Fig. S9), trench 2 (Fig. S10), and other stream exposures northwest of the logged stream exposure (Fig. 3), which are not included in the *Bulletin* paper.

Part 4. This part is a list of additional references that are not included in the *Bulletin* paper, but which might be of use to other geologists studying the Marikina Valley.

Part 1 - Logs of Trench and Stream Exposures at the Maislap Site

Surficial deposits at the Maislap site consist of interbedded pebbly to cobbly stream channel deposits, weathered, sandy, silty colluvium, and mixtures of sandy, silty alluvium and colluvium washed from small drainages and hillslopes along the sides of the strike valley or deposited along the main stream during flooding (Fig. 3). Most channel deposit clasts are rounded and subrounded, whereas a much greater proportion of clasts in colluvium are angular to subangular. Debris flow deposits with rounded cobbles are also interbedded with alluvium and colluvium near the mouth of the valley of tributary 1 and in the middle of trench 1. The Angat ophiolite of possible Cretaceous age underlies the drainage basin of the main stream (Arcilla *et al.* 1989). Where exposed, the ophiolite consists of layered gabbros, diabase sheeted dikes, and pillow basalts (Arcilla *et al.* 1989). Most of the highly weathered clasts in the surficial deposits of the valley are derived from these mafic units.

Logging of two trenches and one natural exposure was completed during six weeks of field work in February and early March 1995. The Philippine Institute of Volcanology and Seismology (PHIVOLCS) handled all logistical arrangements and permits and the U.S. Geological Survey and PHIVOLCS collaborated on the scientific aspects of the trenching program. First, we excavated a 42-m-long trench (trench 1) with a backhoe across the widest part of the valley to locate the most recent trace of the fault (Figs. 3, 4, and S2 through S5; figure numbers without "S" refer to figures in the *Bulletin* paper). We later widened this trench to create a new exposure of the fault zone (Fig. S7). We also logged a 1.5-m-long section of trench wall that connected both walls of trench 1 (Fig. S8), and a 5-m-section of partly exposed trench wall on the southwest side of trench 1 (Fig. S9). Cleaning of natural exposures along a stream that crossed the valley provided additional vertical exposures of the fault in critical areas that could not be reached with a backhoe (Figs. 3, 5, S11, S12, and Part 3 of this supplement). A small 1-m-deep, 3-m-long trench was dug by hand about 2 m southwest of the longest stream exposure and parallel to it to obtain another exposure of the uppermost units in the exposure. Finally, we dug a second 13-m-long trench (trench 2; Fig. S10) between the first trench and the stream exposures. We logged the trenches and the longest stream exposure at a scale of 1:20 and the fault zones in both the northeast (wall 1, Figs. 4A and S6) and southwest (Fig. S9) walls of trench 1 and its widened extension (wall 2, Figs. 4B and S7) at 1:10. Tables S1 through S5 describe stratigraphic units shown in each of the detailed logs. We did not log the hand-dug trench or the small stream exposures on the northwest edge of the valley (described below).

Units of similar genesis in the same part of each trench that we infer to have been deposited at about the same time are assigned a single unit number (Fig. S1). Thus, unit 1a occurs near the bottom of the southeast end of trench 1 and unit 39bBt at the top of its northwest end. Subunits, designated a, b, c, etc., show different lithologic facies of a unit. "Bt" marks units that are largely remnants of argillic B soil horizons. In the common situation where we were uncertain whether or not a new unit or subunit was part of a previously labeled unit (for example, on either side of a fault), we assigned a different number to the new unit.

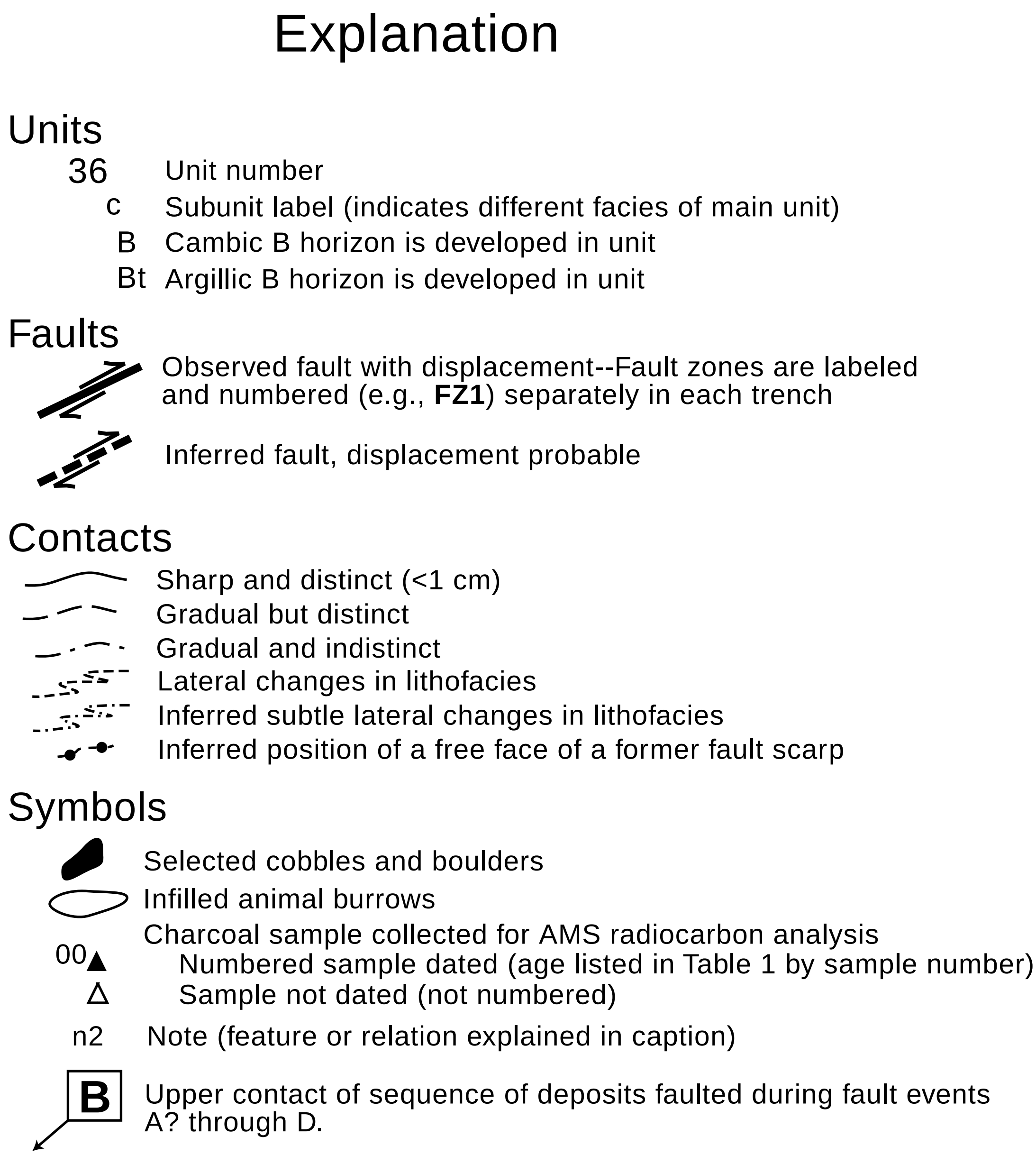


Figure S1. Explanation of units labels, faults, contacts, and symbols used on Figures S2 through S12. Letters within boxes mark unconformities and disconformities bounding the upper surfaces of sequences of deposits faulted during fault events A?, B, C, or D. For example, some fault strands produced during event B extend upward through stream deposits of sequence 2 to the unconformity labeled "B".

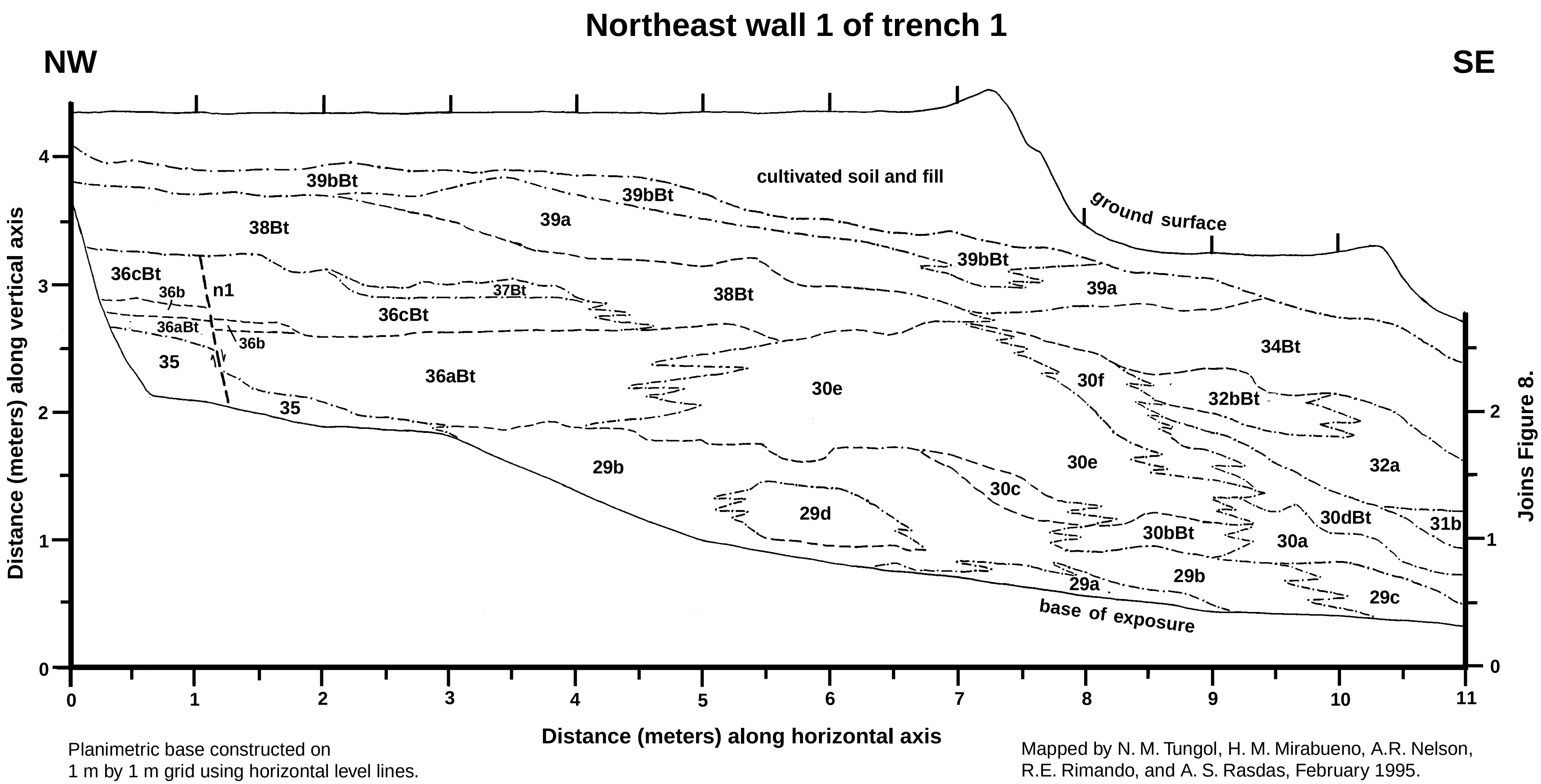


Figure S2. Log of northeast wall 1 of trench 1 between meter coordinates 0 and 11. Face of exposure trends 153°. Trench was logged at a scale of 1:20. Unit labels, contacts, and symbols explained in Figure S1. Descriptions of stratigraphic units appear in Table S1. n1: Small fault, which may be part of an old landslide headscarp.

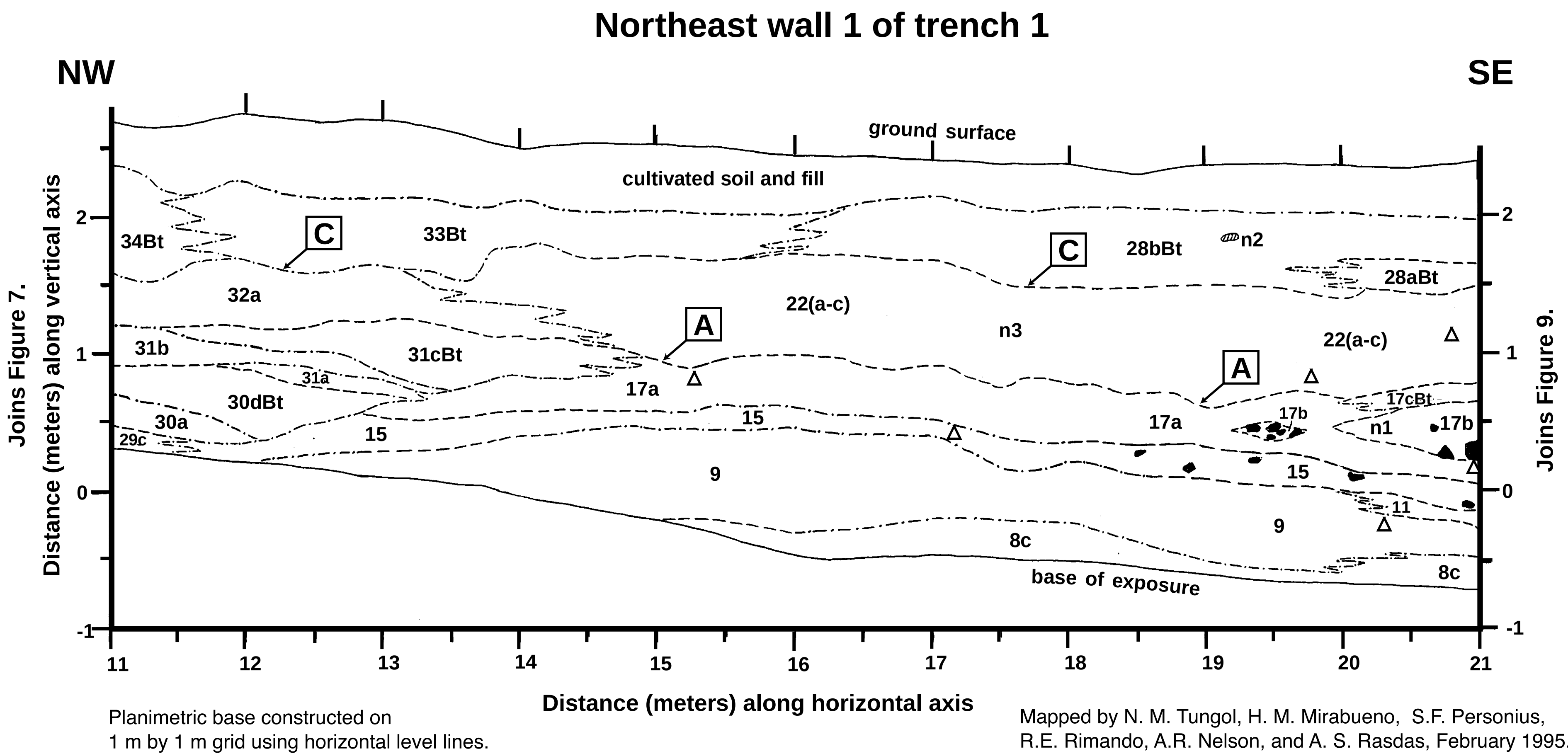


Figure S3. Log of northeast wall 1 of trench 1 between meter coordinates 11 and 21. Face of exposure trends 153^{o}. Trench was logged at a scale of 1:20. Unit labels, contacts, and symbols explained in Figure S1. Descriptions of stratigraphic units appear in Table S1. n1: Distal edge of debris flow deposit, which may have been deposited from the tributary valley north of the stream exposure (Fig. 2B). n2: Distinct filled animal burrow. n3: Unconformity (B on Figs. S4 and S6) at the top of sequence 2 stream deposits (Fig. 4) was not recognized in this part of the trench, perhaps because sequence 2 deposits were never deposited here.

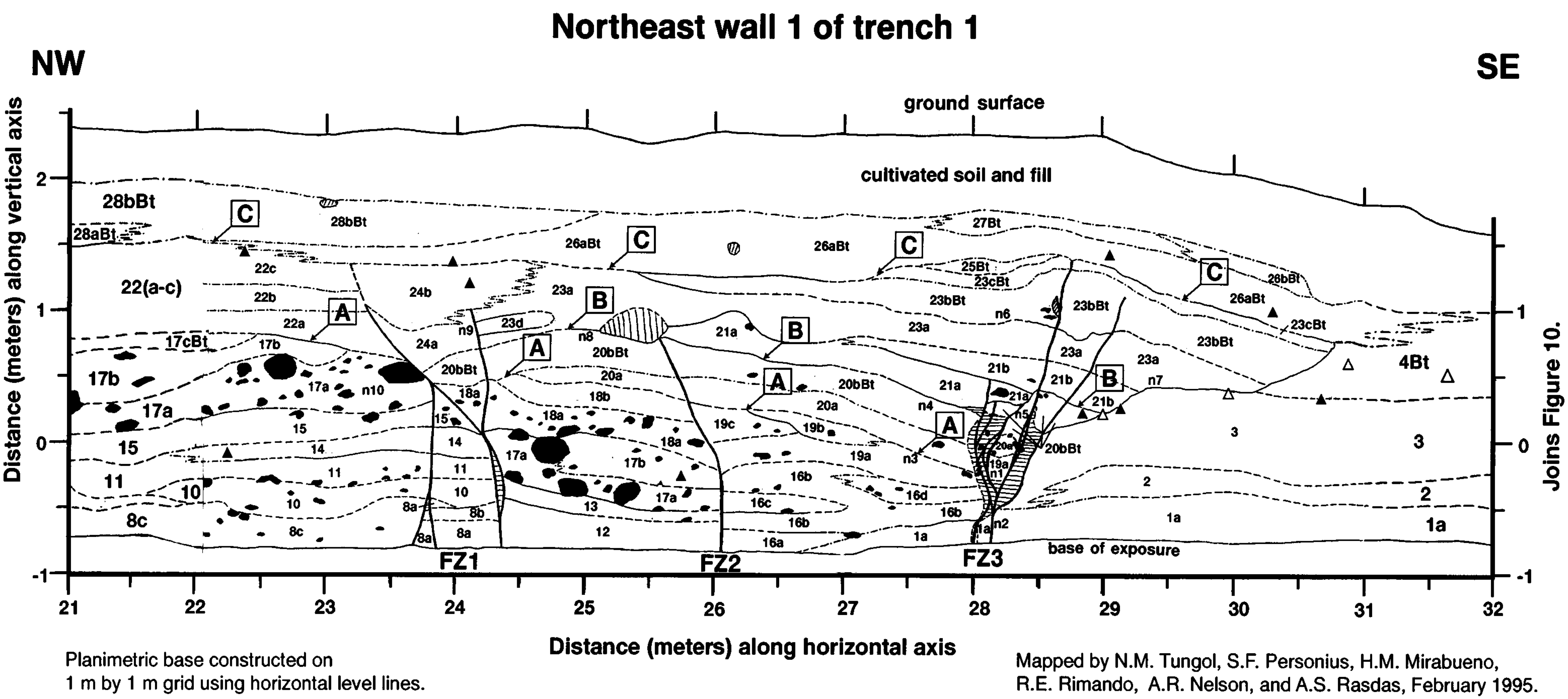


Figure S4. Log of northeast wall 1 of trench 1 between meter coordinates 21 and 32. Detailed part of the log between meter coordinates 22 and 31, which was logged at a scale of 1:10, is shown on Figure S6. Other parts of log were logged at a scale of 1:20. Face of exposure trends 150°. Unit labels, contacts, and symbols explained in Figure S1. Descriptions of stratigraphic units appear in Table S1 and radiocarbon data in Table 1 (numbered samples appear on Figure S6).

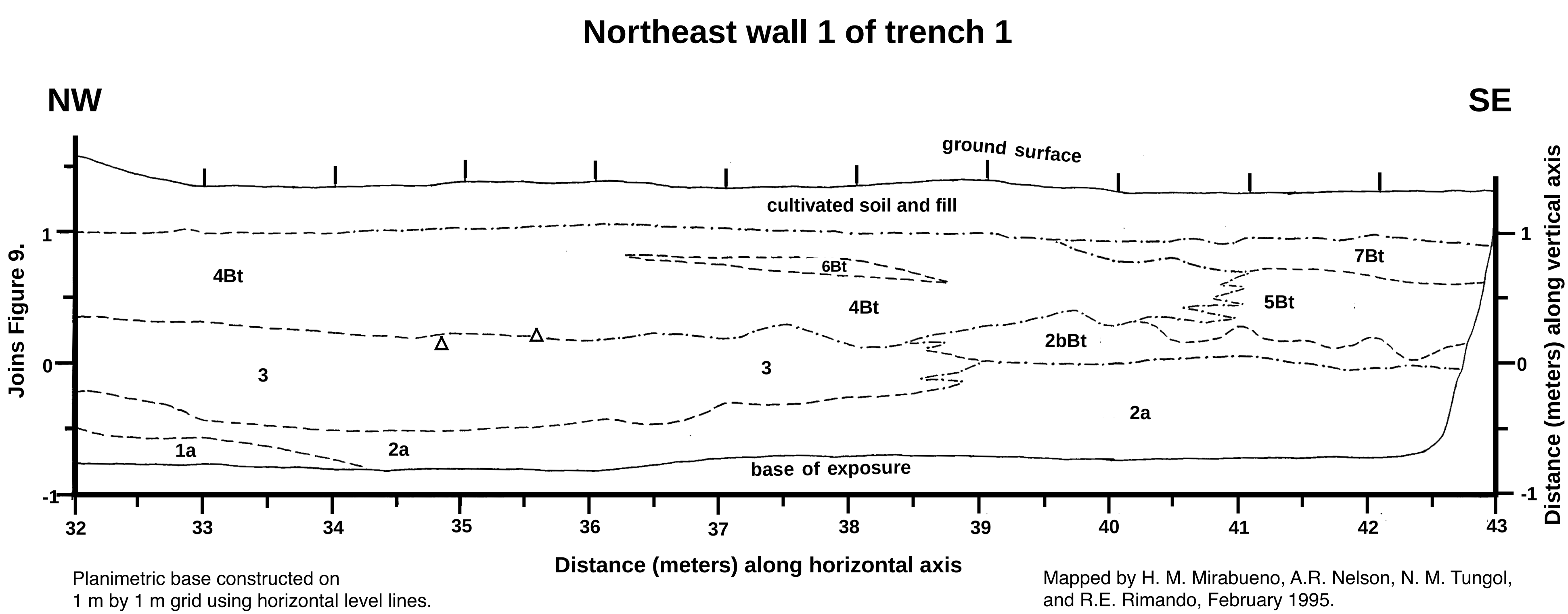


Figure S5. Log of northeast wall 1 of trench 1 between meter coordinates 32 and 43. Face of exposure trends 153°. Trench was logged at a scale of 1:20. Unit labels, contacts, and symbols explained in Figure S1. Descriptions of stratigraphic units appear in Table S1. Blotchy differences in the amount of clay and grussified sand in the upper half of the log suggest that much of units 3-6 may be highly burrowed.

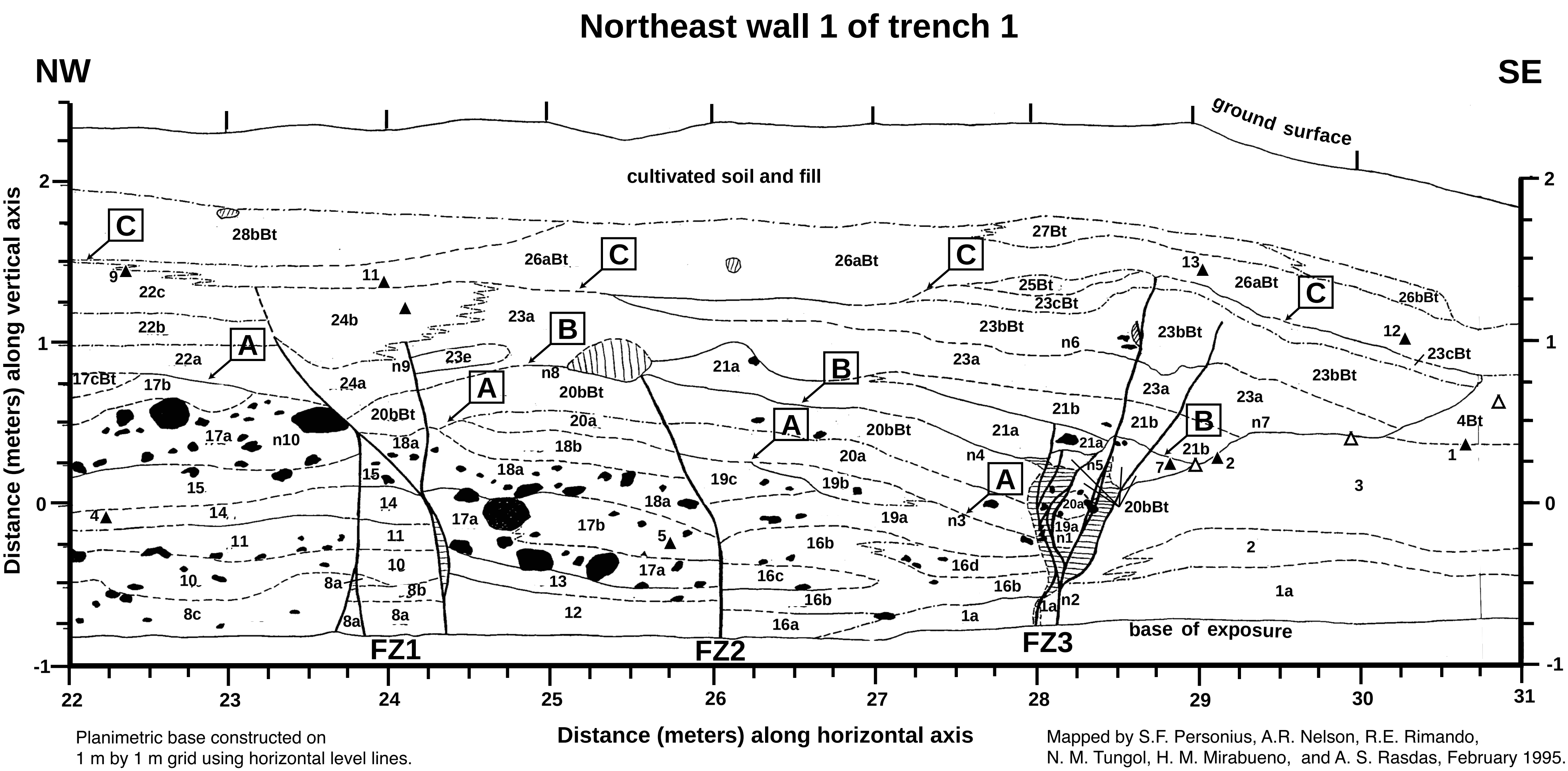


Figure S6. Detailed log of northeast wall 1 of trench 1 between meter coordinates 22 and 31. Face of exposure trends 153°. Trench was logged at a scale of 1:10. Unit labels, contacts, and symbols explained in Figure S1. Descriptions of stratigraphic units appear in Table S1. Numbered ^{14}C samples are listed in Table 1. Because of difficulties in determining whether some units occur on both sides of the fault zones that we assume to have meters of horizontal displacement, we assign units on opposite sides of fault zones different unit numbers unless we are sure that they are the same unit. n1: Details of the shear zone in FZ3 were difficult to map because this part of the trench wall was unstable; the zone includes voids, cobbles, gravelly sediment from units to the northwest, and clasts of silty sediment from units to the southeast, much of it stained black, probably from manganese in groundwater. n2: More faults than are shown are probably present, but are difficult to distinguish in the massive silty units at the base of the trench (which was frequently submerged). n3: Reddish-brown clay coating highly weathered clasts and lining pores in the upper half of unit 19 may be the remains of a Bt horizon on unit 19, although some of this clay may in infiltrated from the Bt horizon developed on unit 20. n4: Reddish (5YR) clay is very abundant throughout the upper half of unit 20 and more than half the clasts are completely weathered. n5: We could not determine whether the step in the upper contact of unit 20 was erosional or displaced by a fault; perhaps it is both. n6: Lower contact of the Bt horizon on unit 23 is more indistinct and irregular than portrayed here. n7: 2-5-cm-thick gravelly beds in unit 23 at this location are deformed but not displaced. n8: Top of the Bt horizon on unit 20 is clearly eroded. n9: Truncation of small lenses of sediment at faults indicates at least decimeters of lateral fault displacement. n10: Cobbly debris flow deposit.

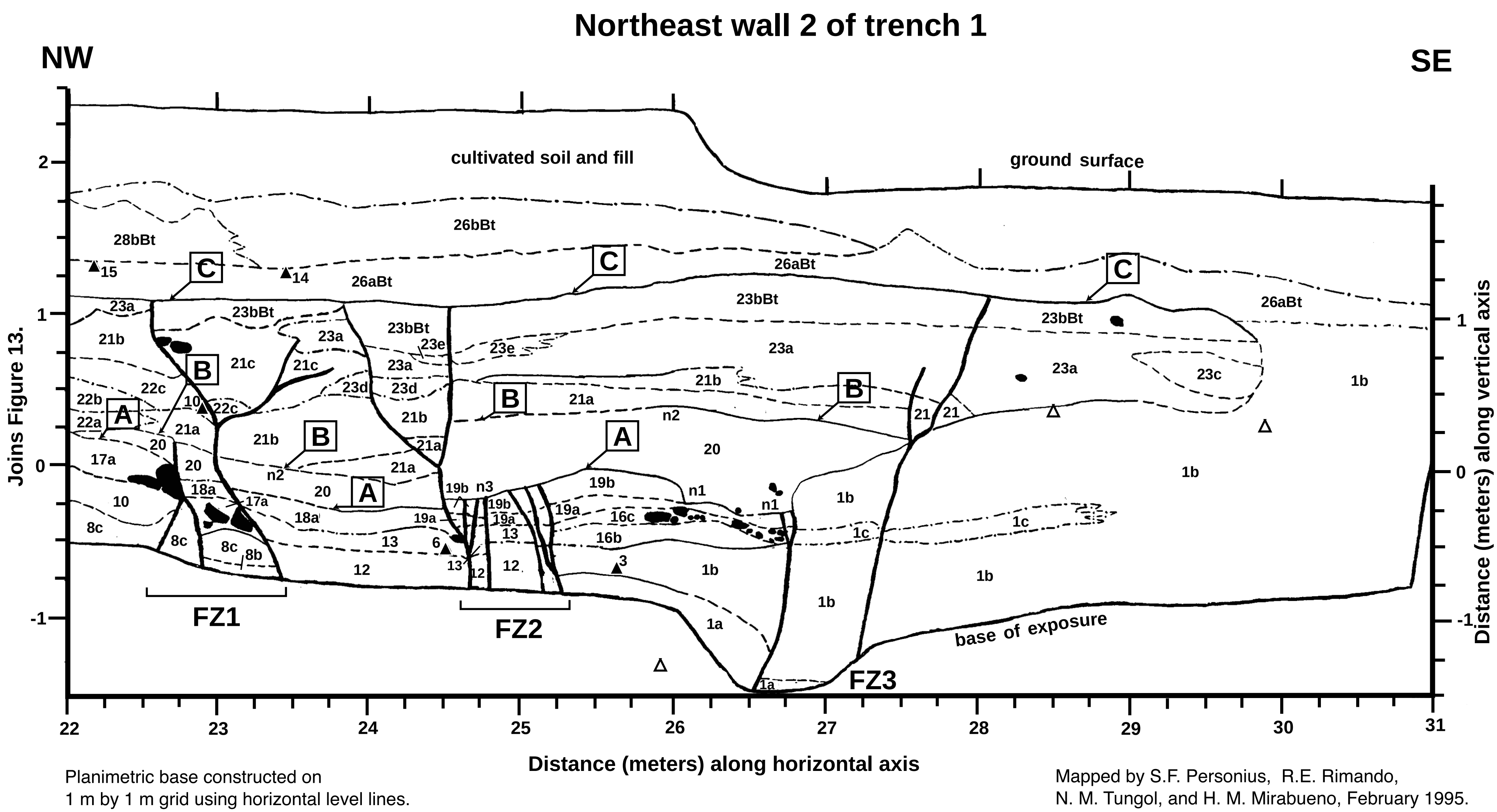
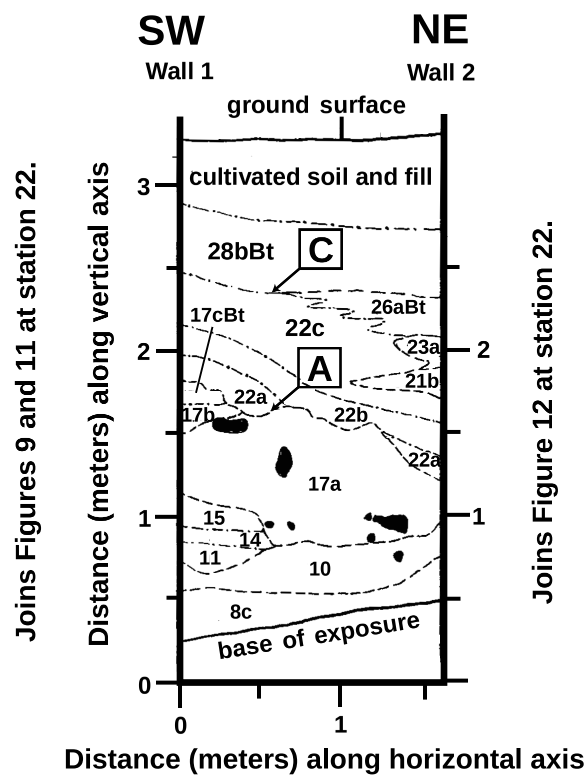


Figure S7. Detailed log of northeast wall 2 of trench 1, logged at a scale of 1:10. Face of exposure trends 153°. Unit labels, contacts, and symbols explained in Figure S1. Most units are numbered the same as those described from northeast wall 1 of trench 1 (Figure S6 and Table S1), so only a limited number of unit descriptions were made (Table S2). Vertical and horizontal datums are the same as in wall 1 of trench 1. Numbered ^{14}C samples are listed in Table 1. n1: Channel cut into unit 19 truncates faults at station 26.7. n2: Erosional unconformity at the top of the Bt horizon developed in unit 20. n3: Six other strands of the fault truncated by the channel filled by unit 20.

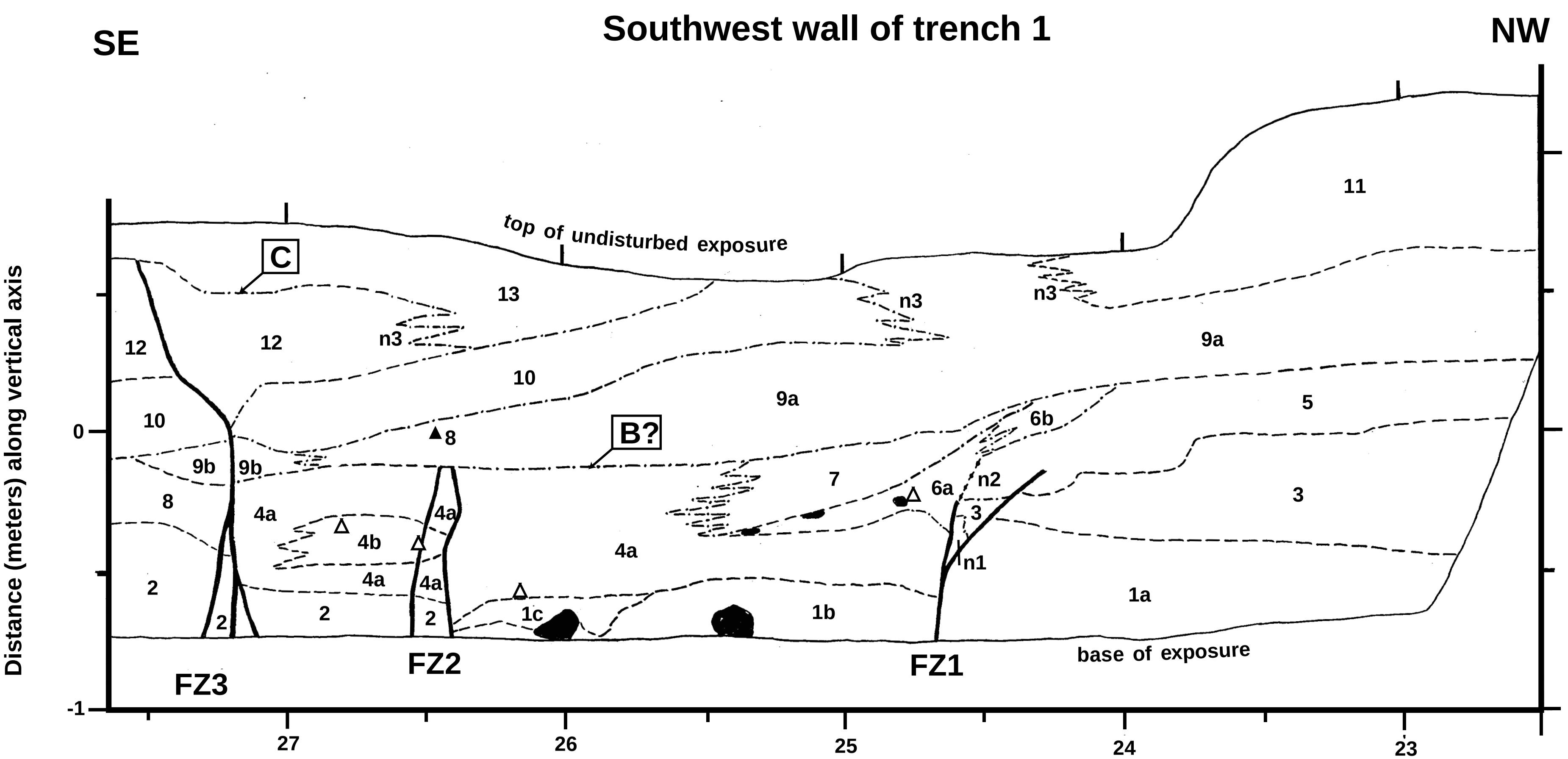
Northwest wall of trench 1



Planimetric base constructed on
1 m by 1 m grid using horizontal level lines.

Mapped by S.F. Personius, R.E. Rimando, N. M. Tungol, and
H. M. Mirabueno, February 1995.

Figure S8. Log of the northwest wall of trench 1. Face of exposure trends 63^o. This short exposure is perpendicular to and connects northeast walls 1 and 2 of trench 1 at meter coordinate 22. The exposed deposits are the same as those found in walls 1 and 2, so none of these units were described. Unit labels, contacts, and symbols explained in Figure S1. The unconformity (B on Figures S4 and S6) at the top of sequence 2 stream deposits (Fig. 3) was not recognized on this wall, perhaps because sequence 2 deposits were never deposited here.



Planimetric base constructed on
1 m by 1 m grid using horizontal level lines.

Mapped by R.E. Rimando, S.F. Personius,
N. M. Tungol, and H. M. Mirabueno, February 1995.

Figure S9. Log of the southwest wall of trench 1, logged at a scale of 1:10. Face of exposure trends 153°. Vertical datum is the same as northeast walls of trench 1; horizontal datum was projected perpendicular to northeast walls of trench 1. Unit labels, contacts, and symbols explained in Figure S1. Although some of these units are probably the same units as exposed on the northeast walls of trench 1, this wall is too far from the northeast walls for us to be certain of unit correlations. For this reason, the stratigraphic units in this exposure are numbered separately and described in Table S3. The single radiocarbon age (no. 8; unit 9a) is listed in Table 1. n1: Fracture filled with loose sediment from units 3 and 4. n2: Formerly exposed free face of a fault scarp buried by colluvium derived from unit 5. n3: Indistinct, gradual facies changes here indicate that these parts of the trench may have been highly burrowed.

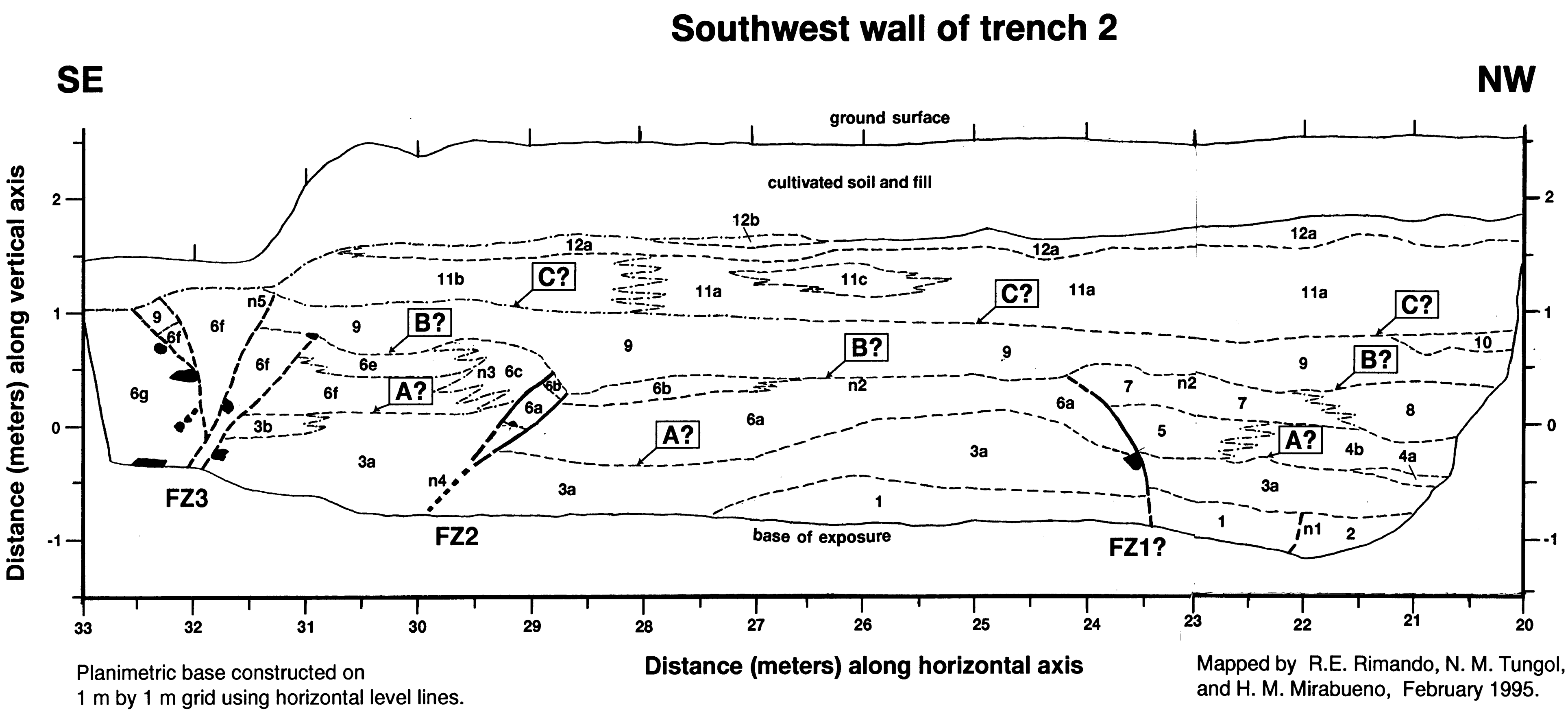


Figure S10. Log of the southwest wall of trench 2. Face of exposure trends 153°. Trench was logged at a scale of 1:20. Vertical datum is same as in trench 1; horizontal datum is projected perpendicular from trench 1. Unit labels, contacts, and symbols explained in Figure S1. Descriptions of stratigraphic units appear in Table S4. n1: fault is inferred only from abrupt termination of gravelly unit 2. n2: Erosional unconformity at the top of units 6 and 7. n3: Domed shape of unit 6c suggests that it contains unrecognized splays of the fault; facies changes with units 6e and 6f are particularly indistinct. n4: Trace of the fault in unit 3a is only inferred; we did not identify it in the trench. n5: fault is indistinct but appears to truncate unit 9.

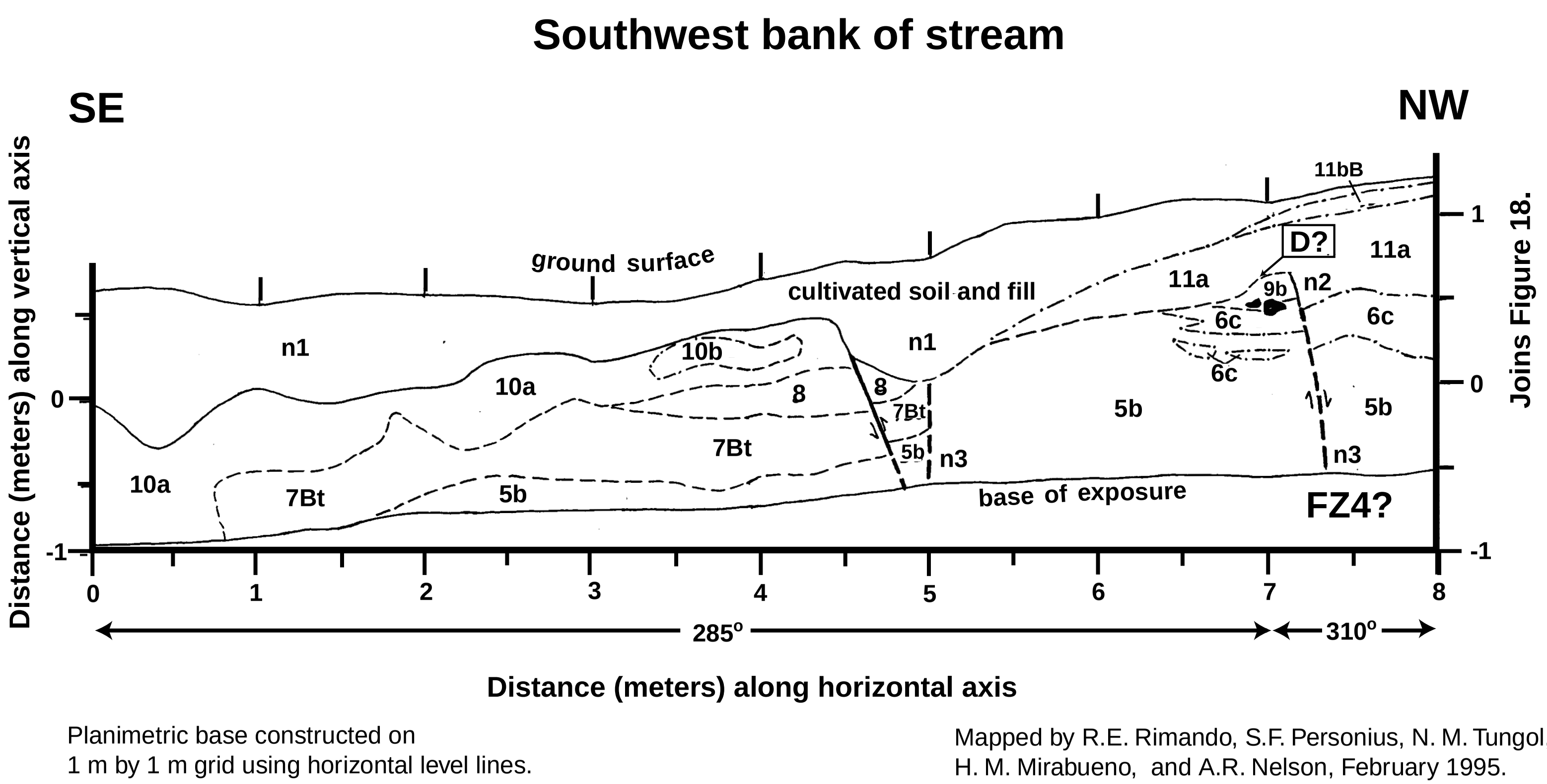


Figure S11. Log of the stream exposure between metric coordinates 0 and 8 on the southwest bank of the creek. Horizontal arrows show trends of face of exposure. Vertical datum is 3.6 m higher than the datum in trenches 1 and 2; horizontal datum is arbitrary. The exposure was logged at a scale of 1:20. Unit labels, contacts, and symbols explained in Figure S1. Descriptions of stratigraphic units appear in Table S5. n1: The loose, sandy texture and abundant coarse charcoal in this unit indicate that it is excavated fill, probably <30 years old. n2: Contacts are particularly indistinct here and, therefore, this part of the log is quite interpretive. n3: Fault traces are particularly difficult to identify in unit 5b and are mainly inferred.

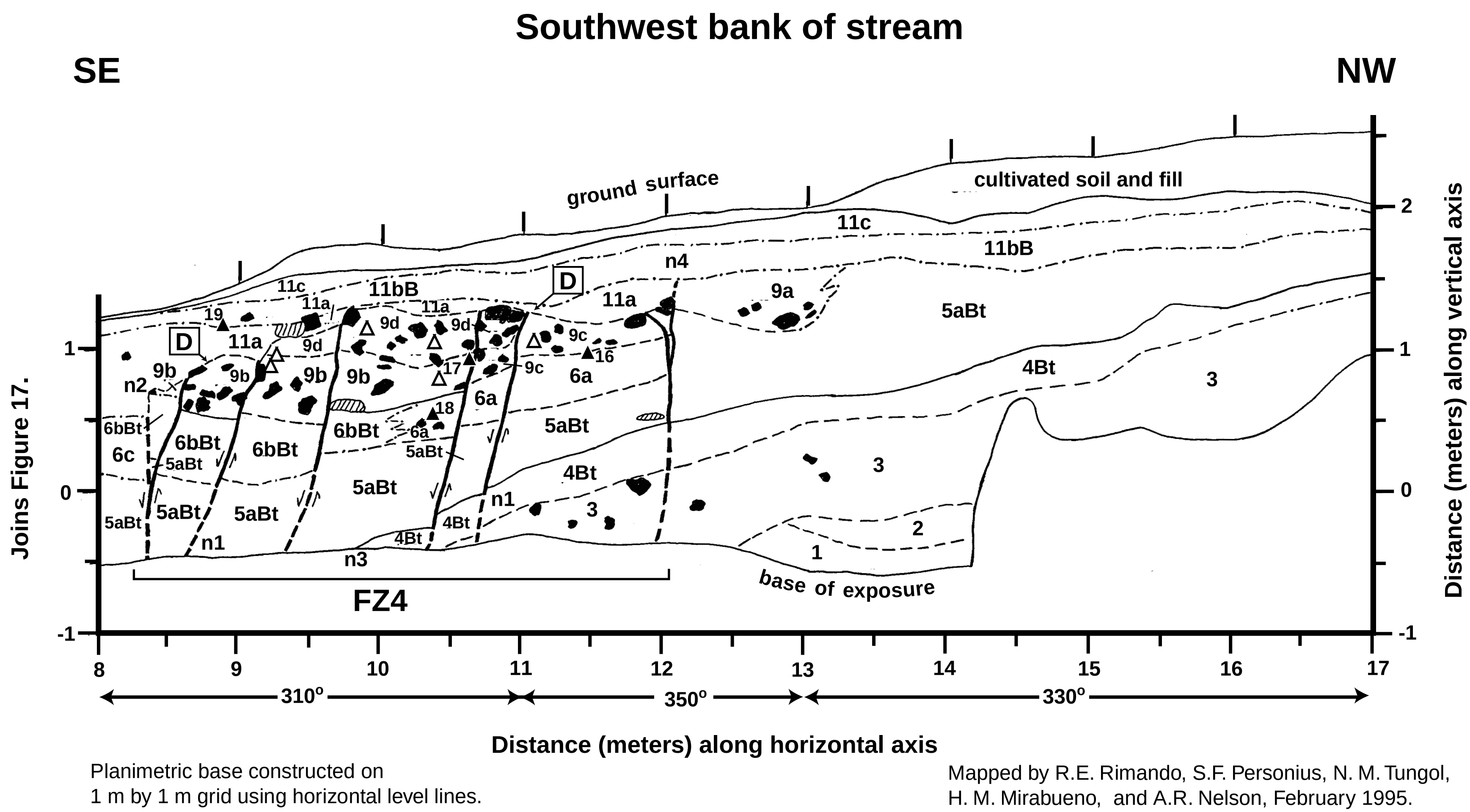


Figure S12. Log of the stream exposure between metric coordinates 8 and 17 on the southwest bank of the creek. Horizontal arrows show trends of face of exposure. Vertical datum is 3.6 m higher than the datum in trenches 1 and 2; horizontal datum is arbitrary. The exposure was logged at a scale of 1:20. Unit labels, contacts, and symbols explained in Figure S1. Descriptions of stratigraphic units appear in Table S5. Numbered ^{14}C samples are listed in Table 1. n1: Fault traces are particularly difficult to identify in units 5a and 4b and are mainly inferred. n2: Contacts are particularly indistinct here and, therefore, this part of the log is quite interpretive; the debris flow deposit, however, is clearly truncated. n3: Stream is flowing on mafic volcanic bedrock at several places along the exposure. n4: 15-20-cm-thick, cambic B horizon has weak, medium, subangular blocky structure, but probably not enough clay to qualify as a Bt horizon; it must be much younger than the Bt horizons in near-surface colluvium in the trenches.

Part 2. Table S1. Description of stratigraphic units in northeast wall 1 of trench 1 (Figs. S2 through S6)[1].

UNIT NO.	STATION LOCATION	GENESIS	COLOR	MATRIX TEXTURE	COARSE FRACTION			LOWER BOUNDARY	STRATIFICATION	OTHER FEATURES
	Horiz., Vert.				%Pebbles	%Cobbles	Clast distribution			
1a	31.20, -0.60	colluvial	10YR 5/2	clay loam	0	0	-	not exposed	massive	Black organic mottling due to groundwater oxidation-reduction
2a	41.20,-0.40	colluvial	10YR 4/3	silty clay loam	0	0	-	clear, wavy	massive	
2bBt	41.20, 0.05	colluvial	7.5YR4/4	clay loam	0	0	-	clear, wavy	massive	Thick clay films and 10YR 6/8 root mottles
3	36.30, -0.2	colluvial	10YR 4/4	clay loam	<1	0	dispersed in lenses	abrupt, wavy	massive	Highly burrowed; weathered pebbles
4Bt	36.30, 0.40	colluvial	7.5YR4/4	sandy clay loam	2	0	evenly dispersed	clear, wavy	massive	Highly burrowed; weathered pebbles
5Bt	41.50, 0.50	alluvial-colluvial	5YR4/4	clay loam	7-15*	0	dispersed in lenses	clear, wavy	weak, discontinuous	10% fine grusified pebbles; clay coats clasts and fractures; very weak angular blocky structure
6Bt	37.20, 0.80	alluvial-colluvial	7.5YR 4/4	clay loam	35	0	matrix supported, dispersed in lenses	clear, wavy	massive	Weathered clasts
7Bt	41.30, 0.80	colluvial	7.5YR4/4	silty clay loam	<1*	0	evenly dispersed	abrupt, smooth	massive	
8a	24.25, -0.68	stream channel	10YR 5/2	sandy loam	50	2	clast supported, semi-stratified	not exposed	weak, interbedded	Discontinuous black mottling
8b	24.15, -0.55	stream channel	10YR 6/4	sandy loam	5	0	matrix supported, semi-stratified	clear, wavy	weak, interbedded	Discontinuous black mottling
8c	15.45, -0.30	stream channel	10YR 7/1	loam	70	<1	clast supported, evenly dispersed	not exposed	massive	Max clast size 5 cm
9	15.2, 0.30	colluvial	10YR 7/6	silty clay loam	5		evenly dispersed	abrupt, wavy	massive	
9	21.05, -0.49	colluvial	10YR 5/2	silt loam	0	0	-	clear, smooth	massive	
9	19.50, -0.30	colluvial	7.5YR4/4	-	1	0	evenly dispersed	not exposed	massive	Abundant black mottles
10	22.35, -0.35	stream channel	10YR 5/2	loam	60	1	clast supported, semi-stratified	clear, wavy	weak, interbedded	Discontinuous black mottling
11	23.31, -0.21	stream channel	10YR 5/2	loam	30	0	clast supported, semi-stratified	abrupt, wavy	distinct, interbedded	Discontinuous black mottling; max clast size 5 cm; mostly sand and fine pebbles W of station 22
12	25.10, -0.71	stream channel	10YR 6/2	sandy loam	70	2	clast supported, semi-stratified	not exposed	distinct, discontinuous	Black organic mottling due to groundwater oxidation-reduction
13	25.20, -0.26	stream channel	10YR 6/3	loam	15	0	matrix supported, semi-stratified	clear, wavy	distinct, discontinuous	
14	23.13, -0.04	stream channel	10YR 5/3	loam	2	0	semi-stratified	abrupt, smooth	weak to massive	Sharp boundary <10 mm; minor black mottling
15	23.13, 0.18	stream channel	10YR 4/3	sandy loam to loam	5	0	semi-stratified	clear, wavy	weak, interbedded	Most clasts and sharp boundary at fault zone; max clast size 5 cm
15	19.05, 0.30	stream channel	7.5YR4/6	loam	50*	0	clast supported, semi-stratified	abrupt, smooth	weak, interbedded	
16a	26.24, -0.75	stream channel	10YR 5/2	loamy sand	60	5	clast supported, semi-stratified	clear, smooth	distinct, lenticular	
16b	27.80, -0.50	stream channel	10YR 5/4	loamy sand	75	0	clast supported, semi-stratified	abrupt, smooth	weak, lenticular to discontinuous	Abundant black horizontal organic mottles
16c	26.45, -0.41	stream channel	10YR 6/3	sandy clay loam	70	2	clast supported, semi-stratified	clear, smooth	distinct, lenticular	Sharp boundary <10 mm; black organic mottling due to groundwater oxidation-reduction
16d	27.75, -0.42	stream channel	10YR 5/3	silt loam to loamy sand	30	0	matrix supported, semi-stratified	abrupt, wavy	weak lenticular to continuous	Upper part is siltier with burrows?, 5% weathered pebbles, and black mottles: debris flow?
17a	25.14, -0.37	debris flow	10YR 6/2	sandy clay loam	40	5	clast supported, evenly dispersed	clear, wavy	weak, discontinuous	<1% boulders, lots of 10-20 cm pebbles

17a	23.12, 0.49	debris flow	7.5YR 5/4	clay loam	10	20	matrix supported, evenly dispersed	clear, wavy	massive	<1% boulders, max size 35 cm
17b	25.53, -0.13	stream channel	7.5YR 6/4	sandy clay loam	40	<1	clast supported, semi-stratified	abrupt, wavy	distinct, lenticular	
17b	22.62, 0.75	stream channel	7.5YR 5/4	sandy clay loam	30	5	clast supported, semi-stratified	clear, wavy	weak, interbedded	
17c	22.21, 0.76	stream channel	7.5YR 5/3	sandy clay loam	1	0	evenly dispersed	clear, wavy	massive	
18a	25.31, 0.11	stream channel	7.5YR 6/4	sandy clay loam	20	5	clast supported, evenly dispersed	clear, wavy	massive	Lots of 10-20 cm pebbles
18b	25.36, 0.32	stream channel	7.5YR 6/4	sandy clay loam	10	0	partly clast supported, evenly dispersed	clear, wavy	massive	80% pebbles are granules
19a	26.34, -0.05	stream channel	10YR 5/6	sandy clay loam	10	<1	matrix supported, evenly dispersed	clear, wavy	distinct, lenticular	Black and yellow oxidation-reduction mottles
19a	27.70, -0.25	stream channel	7.5YR 4/3 -10YR5/3	loamy sand	50	0	clast supported, semi-stratified	clear, smooth	massive to weak lenticular	Clay coats pores in upper 2/3 of unit; 40% weathered pebbles in upper unit, 20% in lower
19b	26.76, 0.11	stream channel	10YR 4/6	loam	35	<1	clast supported, semi-stratified	abrupt, wavy	distinct, weak current	Sharp boundary 3 mm
19c	26.29, 0.12	stream channel	10YR 4/6	sandy clay loam	40	0	clast supported, stratified	abrupt, smooth	distinct, current	Sharp boundary 5 mm
20a	26.12, 0.50	stream channel	7.5YR 5/4	sandy clay loam	80	0-1	clast supported, stratified	abrupt, smooth	distinct, current	Sharp boundary 5 mm; 1% cobbles in beds of 3-10-mm-thick pebbles; 10-30% weathered pebbles
20bBt	27.50, 0.31	stream channel	5YR 4/6	sandy clay loam	85	0	clast supported, semi-stratified	clear, smooth	massive to weak lenticular	Abundant thick reddish clay films coat clasts; 40-50% weathered pebbles
21a	26.14, 0.82	stream channel	10YR 6/4	sandy clay loam	45	1	clast supported, evenly dispersed	abrupt, wavy	massive	Weathered pebbles
21a	28.10, 0.50	stream channel	7.5YR 3/4	loamy sand	90	2	clast supported, stratified	abrupt, smooth	distinct, continuous	Clay coats clasts and fills pores; few weathered clasts; coarser beds are graded
21a	27.60, 0.40	stream channel	10YR 5/3	sandy loam	60	1	clast supported, stratified	abrupt, smooth	distinct, continuous	
21b	28.40, 0.50	stream channel	7.5YR 5/4 -5YR 4/6	sand to loamy sand	40-80	0	clast supported, well stratified	abrupt, smooth	distinct, continuous	Interbedding of beds with different percentages of fine and medium pebbles and infiltrated clay
22a	22.62, 0.92	colluvial	7.5YR 5/4	clay loam	0	0	-	abrupt, smooth	massive	Sharp boundary <10 mm
22b	22.86, 1.10	colluvial	7.5YR 5/4	clay loam	2	0	evenly dispersed	clear, smooth	massive	Very weathered pebbles
22c	22.86, 1.35	colluvial	7.5YR 5/4	clay loam	<1	0	evenly dispersed	clear, smooth	massive	Very weathered pebbles
23a	26.40, 1.01	stream channel	7.5YR 5/4	loam	25	0	clast supported, semi-stratified	abrupt, smooth	distinct, lenticular	
23a	29.3, 0.70	stream channel	7.5YR 4/6	sand	20-40	0	clast supported, stratified	abrupt, smooth	distinct, discontinuous	Broken areas of clay infiltration in upper half of unit
23bBt	26.51, 1.20	stream channel	7.5YR 6/4	loam	40	<10	clast supported, evenly dispersed	clear, wavy	massive	
23bBt	29.70, 0.75	stream channel	7.5YR 4/6	silty clay loam to sandy loam	50-90*	0	dispersed in lenses, semi-stratified	clear, wavy	weak, discontinuous	Broken areas of clay and silt infiltration; 10-20% weathered pebbles; Cox soil horizon
23cBt	28.25, 1.25	stream channel	5YR 4/4	sandy clay loam	40-70	0	clast supported, semi-stratified, clasts in clumps	abrupt, wavy	weak, discontinuous	Abundant thick reddish clay films in some pores and voids; 60-80% weathered pebbles; young Bt superimposed on old Bt?
23d	24.30, 0.87	stream channel	7.5YR 5/4	sandy clay loam	5	0	matrix supported, evenly dispersed	abrupt, smooth	weak to massive	Sharp boundary 5 mm; 50-60% granules
24a	23.69, 0.75	colluvial	7.5YR 5/4	clay loam	5	0	evenly dispersed	abrupt, wavy	massive	Very weathered pebbles
24b	23.68, 1.11	colluvial	7.5YR 5/4	clay loam	1	0	evenly dispersed	clear, smooth	massive	
25Bt	28.00, 1.33	alluvial-colluvial	5YR 4/4	sandy clay loam	20-40	0	matrix supported, dispersed in lenses	abrupt, smooth	massive to weak lenticular	Abundant thick reddish clay films filling voids and coating clasts; 80-90% weathered pebbles

26aBt	29.50, 1.25	colluvial	7.5YR 4/4	silty clay loam	0-2	0	dispersed in lenses	abrupt, smooth	massive	Most pebbles weathered
26aBt	25.92, 1.50	colluvial	7.5YR 6/4	clay loam	1*	0	evenly dispersed	abrupt, wavy	massive	
26bBt	30.00, 1.37	alluvial-colluvial	7.5YR 4/4	silty clay loam	25*	0	matrix supported, evenly dispersed	clear, smooth	massive	5% weathered clasts
27Bt	28.3, 1.7	alluvial-colluvial	7.5YR 3/4	silt loam	30-45*	0	matrix supported, dispersed in lenses	clear, wavy	massive to weak lenticular	5% weathered clasts
28bBt	23.02, 1.61	colluvial	7.5YR 4/4	clay loam	1	0	evenly dispersed	clear, wavy	massive	
29a	8.80, 0.65	alluvial-colluvial	10GY 6/1	clay loam	35*	15	clast supported, semi-stratified	not exposed	weak, lenticular	Some weathered clasts
29b	8.15, 0.80	alluvial-colluvial	7.5YR 6/4	sandy clay loam	30*	0	matrix supported, evenly dispersed	abrupt, smooth	massive	Sharp boundary <10 mm
29d	5.75, 1.30	colluvial	7.5YR 5/4	clay loam	3	0	dispersed in lenses	abrupt, smooth	massive	Sharp boundary <10 mm; highly weathered clasts
30bBt	8.65, 0.95	colluvial	7.5YR 6/4	clay loam	5	0	dispersed in lenses	abrupt, smooth	massive	
30c	7.40, 1.25	colluvial	7.5YR 6/4	sandy clay loam	5*	0	matrix supported, dispersed in lenses	abrupt, smooth	massive	
30dBt	9.40, 1.45	colluvial	7.5YR 5/6	silty clay loam	5	0	evenly dispersed	abrupt, wavy	massive	
30dBt	11.55, 0.95	colluvial	5YR 4/4	silt loam	2*	0	dispersed in lenses	clear, wavy	massive	Weathered pebbles
30e	6.20, 2.30	colluvial	7.5YR 4/4	sandy clay loam	-	0	matrix supported, evenly dispersed	abrupt, irregular	massive	
30f	8.25, 2.20	colluvial	10YR 5/8	sandy loam	2*	0	evenly dispersed	abrupt, smooth	massive	
32bBt	8.90, 2.15	colluvial	7.5YR 5/4	silt loam	2	0	evenly dispersed	abrupt, smooth	massive	Many weathered pebbles; strong angular blocky soil structure
33Bt	14.75, 1.75	alluvial-colluvial	7.5YR 4/4	sandy loam	5	0	dispersed in lenses, clasts in clumps	abrupt, smooth	massive	
34Bt	8.50, 2.5	alluvial-colluvial	7.5YR 4/4	sandy loam	35*	0	matrix supported, evenly dispersed	abrupt, smooth	massive	Weathered pebbles
36aBt	2.50, 2.40	alluvial-colluvial	7.5YR 4/4	sandy clay loam	25*	0	matrix supported, evenly dispersed	abrupt, wavy	massive	Weathered pebbles
36b	1.30, 2.75	alluvial-colluvial	10YR 6/4	loam	50	0	clast supported in some areas	abrupt, smooth	massive	
36cBt	2.50, 2.85	alluvial-colluvial	5YR 6/1	silty clay loam	30	0	matrix supported, evenly dispersed	clear, wavy	massive	Weathered pebbles
37Bt	2.40, 2.90	colluvial	5YR 5/1	sandy loam	2	0	dispersed in lenses	abrupt, smooth	massive	Stone line with weathered clasts
38Bt	2.00, 4.25	alluvial-colluvial	5YR 6/1	silt loam	30	0	matrix supported, evenly dispersed	abrupt, wavy	massive	Many weathered pebbles
39bBt	7.05, 3.05	colluvial	7.5YR4/4	silty clay loam	2	0	evenly dispersed	clear, smooth	massive	Strong angular blocky soil structure.

[1]Color, texture, and boundary terms follow descriptive systems of Soil Survey Staff (1993). Dash indicates not applicable or that property was not described. Units with clasts that are more angular than “subangular to subrounded” are marked with an asterisk under "% pebbles". The few boulders in the middle of the trench are shown on Figures S4 through S6. Units that appear on Figures S2 through S6 but not in this table were not described. Descriptions for some of the same units also appear in Table S2 for units in northeast wall 2 of trench 1 (Fig. S7).

Part 2. Table S2. Description of stratigraphic units in northeast wall 2 of trench 1 between stations 22 m and 31 m (Fig. S7)[1].

UNIT NO.	STATION LOCATION	GENESIS	COLOR	MATRIX TEXTURE	COARSE FRACTION			LOWER BOUNDARY	STRATIFICATION	OTHER FEATURES
	Horiz., Vert.				%Pebbles	%Cobbles	Clast distribution			
1b	28.10, 0.10	colluvial	7.5YR 5/6	silty clay loam	0	0	-	not exposed	massive	
1b	26.40, -0.7	colluvial	7.5YR 6/1	silt loam	0	0	-	clear, smooth	massive	Iron and black organic mottling due to groundwater oxidation-reduction
1c	27.70,-0.40	alluvial-colluvial	10YR 7/3	silt loam	15	0	matrix supported, clasts in clumps	clear, smooth	massive	Max clast size 2 cm; black stains along cracks
10	22.50,-0.3	stream channel	7.5YR6/6	sandy loam	2	0	matrix supported, clasts in clumps	abrupt, smooth	-	Max clast size 2 cm; coarse sand matrix
16c	26.40, -0.35	stream channel	10YR 6/4	sand	25	45	clast supported, dispersed in lenses	clear, wavy	massive	Max clast size 12 cm; coarse sand matrix
21	27.60, 0.30	stream channel	7.5YR6/6	sand	>70	0	clast supported	sharp, smooth	massive	Max clast size 3.5 cm
21	27.80, 0.40	stream channel	7.5YR6/6	loam	70	0	clast supported	sharp, smooth	weak, discontinuous	poorly sorted
21a	24.00, 0.0	stream channel	7.5YR4/6	sandy clay loam	70	<1	clast supported	abrupt, smooth	distinct, lenticular	Max clast size 3 cm
21b	22.40, 0.80	stream channel	7.5YR4/4	silt loam	60	10	clast supported	abrupt, smooth	massive	Max clast size 12 cm
21b	23.20, 0.20	stream channel	7.5YR 6/6	silty clay loam	40	20	clast supported	abrupt, smooth	massive	Max clast size 12 cm
21b	25.2, 0.56	stream channel	7.5YR 5/6	sandy clay loam	60	10	clast supported, evenly dispersed	abrupt, smooth	massive	Weathered pebbles; poorly sorted
21b	26.00, 0.60	stream channel	5YR5/6	sand	>70	<1	clast supported	abrupt, smooth	distinct, lenticular	Max clast size 5 cm
21b	26.90, 0.45	stream channel	7.5YR 5/6	loamy sand	-	-	clast supported	abrupt, smooth	weak, lenticular	Max clast size 5.5 cm
22a	22.40, 0.30	colluvial	-	sandy loam	1	0	matrix supported, evenly dispersed	abrupt, smooth	massive	Max clast size 2.5 cm
22b	22.25, 0.55	colluvial	5YR 5/6	sandy loam	-	0	matrix supported, evenly dispersed	clear, smooth	weak, lenticular	Max clast size 2 cm; weathered pebbles
22c	22.4, 0.60	colluvial	5YR 4/6	loamy sand	0	0	-	abrupt, smooth	weak, lenticular	
22c	23.1, 0.40	colluvial	10YR 6/4	sandy loam	1	0	matrix supported, evenly dispersed	abrupt, smooth	massive	Max clast size 2 cm
23a	22.8, 1.05	stream channel	5YR 4/4	sandy loam	40-50	-	clast supported, semi-stratified	abrupt, smooth	weak, lenticular	Max clast size 6 cm
23a	29.40, 0.75	stream channel	7.5YR 4/6	clay loam	30	0	matrix supported, clasts in clumps	abrupt, smooth	massive	Max clast size 2.5 cm
23e	24.80, 0.75	stream channel	10YR 4/6	loam	70	<1	clast supported, semi-stratified	abrupt, smooth	weak, lenticular	Max clast size 2.5 cm; poorly sorted
23e	29.40, 0.60	stream channel	7.5YR 6/6	loam	60	0	clast supported, semi-stratified	abrupt, smooth	weak, discontinuous	Max clast size 3.5 cm

[1]Color, texture, and boundary terms follow descriptive systems of Soil Survey Staff (1993). Dash indicates not applicable or that property was not described. Units with clasts that are more angular than “subangular to subrounded” are marked with an asterisk under "% pebbles". The few boulders in the middle of the trench are shown on Figure S7. Units that appear on Figure S7, but are not in this table were not described. Descriptions for many of the same units also appear in Table S1 for units in northeast wall 1 of trench 1 (Fig. S6). Unit labels such as "23", which do not include a letter designating a subunit, mark units that may correspond with one of several subunits on the opposite sides of faults.

Part 2. Table S3. Description of stratigraphic units in the southwest wall of trench 1 (Fig. S9)[1].

UNIT NO.	GENESIS	COLOR	MATRIX TEXTURE	COARSE FRACTION			LOWER BOUNDARY	STRATIFICATION
				%Pebbles	%Cobbles	Clast distribution		
1a	stream channel	7.5YR 5/2	loam	70	2	clast supported, evenly dispersed	not exposed	massive
1b	stream channel	10GY4/1	loamy sand	60	1	clast supported	not exposed	weak
1c	stream channel	10GY4/1	sand	5	2	matrix supported, evenly dispersed	abrupt wavy	massive
2	stream channel	10Y5/2	loam	5	0	matrix supported, mostly in clumps	not exposed	massive; stone line across unit
3	alluvial-colluvial	10YR 5/2	loam	2	0	matrix supported, evenly dispersed	clear smooth	massive, Fe and black staining
4a	alluvial-colluvial	7.5Y5/2	silt loam - loam	2	0	matrix supported, in clumps	abrupt wavy	massive
4b	alluvial-colluvial	10Y5/1	loam	7	0	matrix supported, mostly in clumps	gradual smooth	massive, charcoal rich
5	stream channel	10YR 5/2	loam	25	0	mostly in clumps	gradual smooth	massive, stained and weathered
6a	colluvial	10Y6/1	silt loam	55	2	clast supported, cobbles in clumps	clear wavy	massive, Fe staining
6b	colluvial	10Y6/1	silt loam	25	0	matrix supported, mostly in clumps	clear wavy	massive, weathered colluvium of unit 5
7	colluvial	2.5Y5/2	silt loam	3	0	matrix supported, cobbles in clumps	clear wavy	massive, Fe staining
8	stream channel	7.5YR5/3	sand	20	0	matrix supported, evenly dispersed	abrupt wavy	massive
9a	alluvial-colluvial	7.5YR 5/6-10YR5/4	loam	0-10	0	matrix supported, evenly dispersed	clear smooth	massive, Fe and black staining
9b	alluvial-colluvial	7.5YR 5/6-	loamy sand	10	0	matrix supported, evenly dispersed	clear smooth	weak
10	stream channel	7.5YR5/3	sand	20	0	matrix supported, evenly dispersed	abrupt wavy	massive
11	alluvial-colluvial	7.5YR 4/4	loam	10	0	matrix supported, evenly dispersed	clear smooth	massive, Fe staining
12	stream channel	7.5YR6/4	loamy sand	40	20	clast supported, cobbles in clumps	abrupt wavy	weak; stone line across unit
13	stream channel	7.5YR6/4	loamy sand	60	0	clast supported, evenly dispersed	clear wavy	massive

[1]Color, texture, and boundary terms follow descriptive systems of Soil Survey Staff (1993). Clasts are subangular to subrounded.

Part 2. Table S4. Description of stratigraphic units in trench 2 (Fig. S10)[1].

UNIT NO.	GENESIS	COLOR	MATRIX TEXTURE	COARSE FRACTION			LOWER BOUNDARY	COMMENTS
				%Pebbles	%Cobbles	Clast distribution		
1	colluvial	7.5YR 4/6 - 7.5YR5/1	clay loam	0	0	none	not exposed	
2	stream channel	7.5YR 5/1 - 7.5YR 5/6	silty clay	40	10	clast-supported, evenly dispersed	abrupt wavy	Cobbles rounded.
3a	alluvial-colluvial	7.5YR 5/1 - 7.5YR 5/6	silty clay	2	<1	mostly in clumps, pebble line	abrupt wavy	Cobbles rounded, pebbles angular.
3b	alluvial-colluvial	7.5YR 5/4	silt loam	2	0	matrix supported, evenly dispersed	gradual irregular	
4b	stream channel	7.5YR 4/2	silty clay loam	30-40	0	clast-supported, evenly dispersed	abrupt irregular	
5	alluvial-colluvial	7.5YR4/4	silty clay loam	1	3	matrix supported, cobbles in clumps	abrupt irregular	Pebbles angular, upper gravel of T1
6a	stream channel	7.5YR4/4	loamy sand	50	40	clast-supported	abrupt wavy	
6c	stream channel	7.5YR5/3	sand	50	2	clast-supported, mostly in clumps	abrupt smooth	Fine pebbles.
6d	stream channel	5YR5/4	loam	60	2	clast-supported, evenly dispersed	abrupt smooth	
6e	stream channel	7.5YR5/4	silt loam	30	0	clast-supported, evenly dispersed	clear wavy	Fine pebbles.
6f	stream channel	7.5YR5/3	silt loam	40	2	clast-supported, evenly dispersed	clear irregular	
6g	stream channel	7.5YR4/3	silt loam	40	5	clast-supported, evenly dispersed	not exposed	
7	alluvial-colluvial	7.5YR4/3	silty clay loam	1	0	matrix supported, evenly dispersed	abrupt wavy	Upper contact is unconformity.
8	stream channel	7.5YR5/3	loamy sand	70	2	clast-supported, mostly in clumps	abrupt wavy	Cobbles rounded.
9	colluvial	7.5YR4/3	silt loam	0	0	none	abrupt wavy	
10	alluvial-colluvial	7.5YR4/4	clay loam	20	0	matrix supported, clasts in lenses	abrupt wavy	
11a	colluvial	7.5YR4/4	silty clay loam	0	0	none	abrupt smooth	Contains indistinct grussified pebbles.
11b	colluvial	7.5YR4/4	silty clay loam	0	0	none	abrupt wavy	Contains indistinct grussified pebbles.
11c	alluvial-colluvial	7.5YR3/4	clay loam	50	0	matrix supported, evenly dispersed	abrupt wavy	Many pebbles angular.
12a	alluvial-colluvial	7.5YR4/3	clay loam	15	0	matrix supported, evenly dispersed	clear wavy	Fine angular pebbles.

[1]Color, texture, and boundary terms follow descriptive systems of Soil Survey Staff (1993). Clasts are subangular to subrounded, except as noted. Three small units (4a, 6b, and 12b) were not described.

Part 2. Table S5. Description of stratigraphic units in stream exposure (Figs. S11 and S12)[1].

UNIT NO.	GENESIS	COLOR	MATRIX TEXTURE	COARSE FRACTION			LOWER BOUNDARY	STRATIFICATION
				%Pebbles	%Cobbles	Clast distribution		
1	alluvial-colluvial	7.5YR 4/2	sandy clay loam	20-40	<1	evenly dispersed	not exposed	interbedded
2	colluvial	7.5YR 4/2	clay loam	0	0	-	abrupt wavy	lenticular
3	colluvial	7.5YR 4/4 - 7.5YR 3/4	sandy clay loam	10-15	<1	mostly in clumps	clear smooth	massive
4Bt	alluvial-colluvial	7.5YR 4/4	silty clay loam	40-50	<1	matrix supported	abrupt wavy	interbedded
5aBt	colluvial	7.5YR 4/4	clay loam	1	<1	evenly dispersed	abrupt wavy	interbedded
5b	colluvial	7.5YR3/4	silty clay	0	0	-	not exposed	massive
6a	alluvial-colluvial	7.5YR4/4	sandy clay loam	40	0	matrix supported	abrupt wavy	interbedded
6bBt	alluvial-colluvial	7.5YR4/4	clay loam	3-7	0	evenly dispersed	abrupt wavy	interbedded
6c	alluvial-colluvial	7.5YR4/3	clay loam	1-5	0	mostly in clumps	diffuse wavy	massive
7Bt	stream channel	7.5YR4/4	clay loam	50	2-7	evenly dispersed	gradual wavy	interbedded
8	colluvial	7.5YR4/4	loam	0	0	-	abrupt wavy	lenticular
9b	debris flow	7.5YR4/4	clay loam	40-60	15-20	clast supported, cobbles in clumps	abrupt wavy	interbedded
9c	debris flow	7.5YR3/4	loam	30	40	pebbles dispersed, cobbles in clumps	abrupt wavy	interbedded
9d	debris flow	7.5YR3/3	silt loam	10-40	20-50	mostly in clumps	clear wavy	massive
10a	stream channel	7.5YR4/4	loamy sand	40-50	0	matrix supported	abrupt wavy	interbedded
10b	stream channel	7.5YR4/6	loamy sand	30	0	matrix supported	abrupt irregular	lenticular
11a	colluvial	7.5YR4/3	clay loam	0	0	-	diffuse wavy	massive
11bB	colluvial	7.5YR3/3	clay loam	1	<1	evenly dispersed	clear smooth	massive
11c	colluvial	7.5YR4/3	loam	3	0	evenly dispersed	abrupt wavy	massive

[1]Color, texture, and boundary terms follow descriptive systems of Soil Survey Staff (1993). Dash indicates not applicable. Clasts are subangular to subrounded. Unit 9a was not described.

Part 3 - Stratigraphy of Additional Exposures

The southwest wall of Trench 1

A 5-m-long section of the southwest wall of trench 1, parallel to and about 5.5 m southwest of stations 22.5 to 27.6 on wall 1, shows evidence of 2-3 faulting events (Fig. S9). Most of the upper 1.5 m of this section (above the log on Fig. S9) and sections to the northwest and southeast were too disturbed during excavation to log accurately.

Stratigraphic units in the southwest wall are similar to those in wall 1, but the geometry and lithology of most units differs enough from those in wall 1 to make correlations uncertain. For this reason, we number units in the southwest wall independently of those in walls 1 and 2 (Table S3). The gravelly stream channel deposits of unit 1 in the southwest wall (Fig. S9) are probably units 8, 10, and/or 12 in wall 1 (Fig. S6). Units 3-8 in the southwest wall (Fig. S9) are probably about the same age as the much more gravelly channel deposits of units 13-20 in wall 1; of these units in the southwest wall, units 5 and 8 are the only likely channel deposits (Table S3). We show this correlation by labeling the upper contact of units 3-8 "B", as in wall 1. Based primarily on lithology and stratigraphic position, unit 9 in the southwest wall may be the equivalent of unit 22 in wall 1 and units 10 and 12 in the southwest wall the equivalents of units 23-25 in wall 1 (upper contact labeled C, Fig. S9). A single radiocarbon age of 1.5 ka on charcoal from unit 9a (sample 8, station 27.5, Fig. S9; Table 1) shows only that this unit is the same age or younger than the oldest units in wall 1, which have similar ages.

If the above correlations are correct, fault patterns in the southwest wall of trench 1 show evidence of faulting events B and C, and either A? or an earlier faulting event unrecognized in other exposures. Fault strands in FZ1 extend through units 3 and 4 and into unit 5. The lower part of unit 4a is probably a facies equivalent of unit 3;

unit 5 is a channel deposit, cut into unit 3, that does not seem to extend southeast beyond FZ1. At least 25 cm of vertical separation across FZ1 is indicated by the offset of the upper contact of unit 1 in FZ1 and by the thickness of the wedge of gravelly colluvium (unit 6a), which was probably derived from a former fault-scarp free face cut into the distal edge of the channel deposit (unit 5). The colluvial wedge is clear evidence of a faulting event, which may be event A?, that displaced unit 5 before the contact at the tops of units 4, 5, and 7 formed. Event B is recorded in FZ2 by strands that terminate at the top of unit 4a (contact labeled B, Fig. S9). In FZ3, a single fault strand that formed during event C extends to the top of unit 12. The northwest slope of the upper contact of unit 12 (C on Fig. S9) suggests the same type of dome-like deformation during this event that we inferred in FZ3 in wall 1.

Stratigraphy of Trench 2

The lithologies exposed in trench 2 (southwest wall, Fig. S10) were similar to those in trench 1, but the lack of extensive, well stratified stream deposits made it much more difficult to correlate stratigraphic units (numbered independently of those in trench 1) and identify faults in trench 2. We mapped clayey, silty alluvium and colluvium along almost the entire basal third of the trench. The lower of these units (1) is probably the stratigraphic equivalent of units 1-3 in trench 1 (Figs. S6 and S7), but the upper, more extensive unit (3a) may have been deposited about the same time as sequence-1a channel deposits in trench 1 (units 8-19, Fig. S6). Pebbly stream channel deposits that extend the length of trench 2 (unit 6) were deposited on an erosional unconformity cut on the alluvium and colluvium of unit 3 (labeled with A?, Fig. S10). In the central third of trench 2 between stations 24 and 29, the channel deposits contain about 50% pebbles and 40% cobbles. Reddish-brown clay in some of the upper parts of unit 6 records soil development on the stream deposits.

The stream channel deposits of unit 6 (Fig. S10) probably correlate with the channel deposits of sequence 1b (unit 20) in trench 1 (Fig. 4; B? label on Fig. S10). Except at FZ1 at the southeast end of the trench, sandy, fine-grained alluvium and colluvium with angular pebbles in their upper parts (unit 9) overlie unit 6 along the entire trench. Although the upper part of unit 9 may be the stratigraphic equivalent of the similar unfaulted, fine-grained unit 26bBt in trench 1 (Fig. S6), because unit 9 in trench 2 is apparently displaced in FZ3 (discussed below), at least the lower part of unit 9 may have been deposited about the same time as sequence 2 in trench 1 (units 21-25, Figs. S6 and S7; Fig. 4). Such a correlation is indicated by our label of C? on Fig. S10. Another possibility is that the latest displacement on this fault was during the youngest event identified at the site (event D, Fig. 6). The bright reddish color hues in unit 9 and overlying alluvium and colluvium of units 11 and 12 in trench 2 suggest at least several hundred years of soil development following the deposition of unit 9. A layer of cultivated soil and fill almost one meter thick overlies unit 12.

In trench 2, upward-splaying fault strands form zones that are probably the same three zones recognized in trench 1 (Figs. 4, S6, S7, and S10). However, we gained little additional information about faulting event timing in trench 2 because we mapped fewer fault strands, identified fewer fault-strand terminations, and found no samples for radiocarbon dating. In FZ1 near the northwest end of the trench (station 22.5, Fig. S10), a clast-supported gravel unit (unit 2) abruptly abuts the fine-grained colluvium of unit 1. A fault is suggested by the near-vertical contact between the two units, but we could not trace it into the overlying unit (3a). If a fault, this strand could have been produced during faulting event A? (Fig. 6) or an earlier event not recognized in walls 1 or 2 of trench 1.

Strands in all three fault zones displace the pebbly channel deposits of unit 6 in trench 2. A single strand cuts these beds in FZ1. In FZ2, fault strands are difficult to identify in the fine-grained alluvium and colluvium of unit 3a because of the lack of distinct bedding and changes in texture. However, in the overlying unit 6, two upwardly splaying strands displace distinctive pebbly and cobbly beds. The four strands of FZ3 display an upwardly diverging flower-structure pattern (Fig. S10) like that of FZ3 in wall 1 of trench 1 (Figs. 4A and S6). The strands are not everywhere distinct, but clearly displace all the gravelly channel deposits of unit 6. As noted in both walls of trench 1, the channel deposits in FZ3 of trench 2 have been pushed upward into a dome.

If the unit-6 channel deposits of trench 2 correlate with those of sequence 2 in trench 1, the strands formed during faulting event C. But an alternative correlation of unit 6 with sequence 1b (unit 20, trench 1) indicates that they might have formed during event B instead (upper contact labeled B?, Fig. S10). A final possibility is that the latest displacement on this fault occurred during event D, the youngest faulting event identified at the site. Because movement on one of the less distinct strands of FZ3 appears to have thrust pebbly sediment of unit 6 over part of the fine-grained alluvium and colluvium of unit 9, unit 6 most likely correlates with sequence 1b in trench 1 rather than with sequence 2.

Other stream exposures

Natural exposures at the mouth of the tributary 1 valley, about 15 m northwest of the logged stream exposure (Figs. 3 and 5), show stratified, cobbly, pebbly gravel in fault contact with mafic volcanic bedrock. The bedrock forms the base of the escarpment into which the tributary-1 valley is cut. On the east side of the stream, gravel abuts bedrock along a sheared contact, but on the west side, a 0.3-1.0-m-wide, V-shaped fissure extends to a depth of about 1.8 m above the sheared gravel-bedrock contact. The fissure is filled with loose, sandy, silty colluvium, and the abundance of charcoal and disseminated organic material in it indicates a young age for the faulting event that formed the fissure.

Apparently, the young trace of the fault on this edge of the strike valley steps to the south farther to the southwest because we found no evidence of it in the much older colluvial/alluvial deposits exposed near the northwest end of trench 1 about 80 m to the southwest. We did not ^{14}C date the charcoal in the colluvium or log this exposure because we could not determine stratigraphic relations between the colluvium and individual surface-faulting events.

Part 4 - Additional References About the Geology of the Marikina Valley

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