PTHA 2009 — ComMIT Unit Source Combinations

Burbidge et al. (2009) | Geoscience Australia Professional Opinion No. 2009/11

All scenarios (Low Hazard + High Hazard + Historical) in ComMIT input format:
alpha*sourceID+alpha*sourceID+...

Colour legend: LOW HIGH HISTORICAL

ANDAMAN-SUNDA ARC

Unit sources io1–io69 | Row suffixes: c (extra-shallow), b (shallow), a (standard), z (intermediate), y (intermediate-deep), x (deep), w (deepest)

Segment A — Historical: unknown (1762)

Low Hazard Mw: 0.0 | High Hazard Mw: 9.5

Segment A = Arakan coast (Chittagong–Myanmar). Low Mw = 0.0 (unknown magnitude → included in Low scenario at α≈1 per Burbidge 2009 methodology). High α = 62.352 (Mw 9.5).

LOW (Mw ~low)

```
none
```

HIGH (Mw 9.5)

```
62.352*io1b+62.352*io1a+62.352*io2b+62.352*io2a+62.352*io3b+62.352*io3a+62.352*io4b+62.35
2*io4a+62.352*io5b+62.352*io5a+62.352*io5z+62.352*io5y+62.352*io6b+62.352*io6a+62.352*io6
z+62.352*io6y
```

Segment B — Historical: 9.2 (1881, 2004)

Low Hazard Mw: 9.2 | High Hazard Mw: 9.5

Segment B = Andaman–northern Sumatra. Historical scenario calibrated to 2004 IOT (Mw 9.1) with non-uniform slip: io19–22 b/a/z = α 16.706 (Banda Aceh region); io9a = 5.610; io13a = 3.972; io20c = 14.854.

LOW (Mw 9.2 — uniform α 5.130)

```
5.130*io7b+5.130*io7a+5.130*io7z+5.130*io7y+5.130*io8b+5.130*io8a+5.130*io8z+5.130*io8y+5
.130*io9b+5.130*io9a+5.130*io9z+5.130*io9y+5.130*io10b+5.130*io10a+5.130*io10z+5.130*io10
y+5.130*io11b+5.130*io11a+5.130*io11z+5.130*io11y+5.130*io12b+5.130*io12a+5.130*io12z+5.1
30*io12y+5.130*io13b+5.130*io13a+5.130*io13z+5.130*io13y+5.130*io14b+5.130*io14a+5.130*io
14z+5.130*io14y+5.130*io15b+5.130*io15a+5.130*io15z+5.130*io15y+5.130*io16b+5.130*io16a+5
.130*io16z+5.130*io16y+5.130*io17b+5.130*io17a+5.130*io17z+5.130*io17y+5.130*io18c+5.130*
io18b+5.130*io18a+5.130*io18z+5.130*io18y+5.130*io19c+5.130*io19b+5.130*io19a+5.130*io19z
+5.130*io19y+5.130*io20c+5.130*io20b+5.130*io20a+5.130*io20z+5.130*io20y+5.130*io21c+5.13
0*io21b+5.130*io21a+5.130*io21z+5.130*io21y+5.130*io22c+5.130*io22b+5.130*io22a+5.130*io2
2z+5.130*io22y
```

HIGH (Mw 9.5 — uniform α 14.458)

```
14.458*io7b+14.458*io7a+14.458*io7z+14.458*io7y+14.458*io8b+14.458*io8a+14.458*io8z+14.45
8*io8y+14.458*io9b+14.458*io9a+14.458*io9z+14.458*io9y+14.458*io10b+14.458*io10a+14.458*i
o10z+14.458*io10y+14.458*io11b+14.458*io11a+14.458*io11z+14.458*io11y+14.458*io12b+14.458
*io12a+14.458*io12z+14.458*io12y+14.458*io13b+14.458*io13a+14.458*io13z+14.458*io13y+14.4
58*io14b+14.458*io14a+14.458*io14z+14.458*io14y+14.458*io15b+14.458*io15a+14.458*io15z+14
.458*io15y+14.458*io16b+14.458*io16a+14.458*io16z+14.458*io16y+14.458*io17b+14.458*io17a+
14.458*io17z+14.458*io17y+14.458*io18c+14.458*io18b+14.458*io18a+14.458*io18z+14.458*io18
y+14.458*io19c+14.458*io19b+14.458*io19a+14.458*io19z+14.458*io19y+14.458*io20c+14.458*io
20b+14.458*io20a+14.458*io20z+14.458*io20y+14.458*io21c+14.458*io21b+14.458*io21a+14.458*
io21z+14.458*io21y+14.458*io22c+14.458*io22b+14.458*io22a+14.458*io22z+14.458*io22y
```

Segment C — Historical: 8.7 (1861, 2005)

Low Hazard Mw: 8.7 | High Hazard Mw: 9.5

Segment C = Nias–Simeulue region. io23–io26 × 5 rows (b,a,z,y,x). Low α = 3.147; High α = 49.882.

LOW (Mw 8.7 — uniform α 3.147)

```
3.147*io23b+3.147*io23a+3.147*io23z+3.147*io23y+3.147*io23x+3.147*io24b+3.147*io24a+3.147
*io24z+3.147*io24y+3.147*io24x+3.147*io25b+3.147*io25a+3.147*io25z+3.147*io25y+3.147*io25
x+3.147*io26b+3.147*io26a+3.147*io26z+3.147*io26y+3.147*io26x
```

HIGH (Mw 9.5 — uniform α 49.882)

```
49.882*io23b+49.882*io23a+49.882*io23z+49.882*io23y+49.882*io23x+49.882*io24b+49.882*io24
a+49.882*io24z+49.882*io24y+49.882*io24x+49.882*io25b+49.882*io25a+49.882*io25z+49.882*io
25y+49.882*io25x+49.882*io26b+49.882*io26a+49.882*io26z+49.882*io26y+49.882*io26x
```

Segment D — Historical: 9.1 (1797, 1833, 2007)

Low Hazard Mw: 9.1 | High Hazard Mw: 9.5

Segment D = Mentawai Islands region. io27–io33 × 6 rows (c,b,a,z,y,x). Least uncertainty gap: Low α = 6.112; High α = 24.332.

LOW (Mw 9.1 — uniform α 6.112)

```
6.112*io27c+6.112*io27b+6.112*io27a+6.112*io27z+6.112*io27y+6.112*io27x+6.112*io28c+6.112
*io28b+6.112*io28a+6.112*io28z+6.112*io28y+6.112*io28x+6.112*io29c+6.112*io29b+6.112*io29
a+6.112*io29z+6.112*io29y+6.112*io29x+6.112*io30c+6.112*io30b+6.112*io30a+6.112*io30z+6.1
12*io30y+6.112*io31c+6.112*io31b+6.112*io31a+6.112*io31z+6.112*io31y+6.112*io31x+6.112*io
32c+6.112*io32b+6.112*io32a+6.112*io32z+6.112*io32y+6.112*io32x+6.112*io33c+6.112*io33b+6
.112*io33a+6.112*io33z+6.112*io33y+6.112*io33x
```

HIGH (Mw 9.5 — uniform α 24.332)

```
24.332*io27c+24.332*io27b+24.332*io27a+24.332*io27z+24.332*io27y+24.332*io27x+24.332*io28
c+24.332*io28b+24.332*io28a+24.332*io28z+24.332*io28y+24.332*io28x+24.332*io29c+24.332*io
29b+24.332*io29a+24.332*io29z+24.332*io29y+24.332*io29x+24.332*io30c+24.332*io30b+24.332*
io30a+24.332*io30z+24.332*io30y+24.332*io31c+24.332*io31b+24.332*io31a+24.332*io31z+24.33
2*io31y+24.332*io31x+24.332*io32c+24.332*io32b+24.332*io32a+24.332*io32z+24.332*io32y+24.
332*io32x+24.332*io33c+24.332*io33b+24.332*io33a+24.332*io33z+24.332*io33y+24.332*io33x
```

Segment E — Historical: 7.6 (2000)

Low Hazard Mw: 7.6 | High Hazard Mw: 9.5

Segment E = Enggano/southern Sumatra. io34–io37 × 7 rows (c,b,a,z,y,x,w). Low α = 1.0 (very small — Mw 7.6); High α = 35.630 (largest uncertainty gap in Sunda).

LOW (Mw 7.6 — uniform α 1.0)

```
(to be selected)
```

HIGH (Mw 9.5 — uniform α 35.630)

```
35.630*io34c+35.630*io34b+35.630*io34a+35.630*io34z+35.630*io34y+35.630*io34x+35.630*io34
w+35.630*io35c+35.630*io35b+35.630*io35a+35.630*io35z+35.630*io35y+35.630*io35x+35.630*io
35w+35.630*io36c+35.630*io36b+35.630*io36a+35.630*io36z+35.630*io36y+35.630*io36x+35.630*
io36w+35.630*io37c+35.630*io37b+35.630*io37a+35.630*io37z+35.630*io37y+35.630*io37x+35.63
0*io37w
```

Segment F — Historical: 7.8 (1994, 2006)

Low Hazard Mw: 7.8 | High Hazard Mw: 9.5

Segment F = Java–Sumba region. io38–io53 × 7 rows (c,b,a,z,y,x,w). Low α = 1.0 (Mw 7.8 — smallest alpha in study). High α = 9.153.

LOW (Mw 7.8 — uniform α 1.0)

```
(To be selected)
```

HIGH (Mw 9.5 — uniform α 9.153)

```
9.153*io38c+9.153*io38b+9.153*io38a+9.153*io38z+9.153*io38y+9.153*io38x+9.153*io39c+9.153
*io39b+9.153*io39a+9.153*io39z+9.153*io39y+9.153*io39x+9.153*io40c+9.153*io40b+9.153*io40
a+9.153*io40z+9.153*io40y+9.153*io40x+9.153*io41c+9.153*io41b+9.153*io41a+9.153*io41z+9.1
53*io41y+9.153*io41x+9.153*io41w+9.153*io42c+9.153*io42b+9.153*io42a+9.153*io42z+9.153*io
42y+9.153*io42x+9.153*io42w+9.153*io43c+9.153*io43b+9.153*io43a+9.153*io43z+9.153*io43y+9
.153*io43x+9.153*io43w+9.153*io44c+9.153*io44b+9.153*io44a+9.153*io44z+9.153*io44y+9.153*
io44x+9.153*io44w+9.153*io45c+9.153*io45b+9.153*io45a+9.153*io45z+9.153*io45y+9.153*io45x
+9.153*io45w+9.153*io46c+9.153*io46b+9.153*io46a+9.153*io46z+9.153*io46y+9.153*io46x+9.15
3*io46w+9.153*io47c+9.153*io47b+9.153*io47a+9.153*io47z+9.153*io47y+9.153*io47x+9.153*io4
7w+9.153*io48c+9.153*io48b+9.153*io48a+9.153*io48z+9.153*io48y+9.153*io48x+9.153*io48w+9.
153*io49c+9.153*io49b+9.153*io49a+9.153*io49z+9.153*io49y+9.153*io49x+9.153*io49w+9.153*i
o50c+9.153*io50b+9.153*io50a+9.153*io50z+9.153*io50y+9.153*io50x+9.153*io50w+9.153*io51c+
9.153*io51b+9.153*io51a+9.153*io51z+9.153*io51y+9.153*io51x+9.153*io51w+9.153*io52c+9.153
*io52b+9.153*io52a+9.153*io52z+9.153*io52y+9.153*io52x+9.153*io52w+9.153*io53c+9.153*io53
b+9.153*io53a+9.153*io53z+9.153*io53y+9.153*io53x+9.153*io53w
```

Segment G — Historical: none (0)

Low Hazard Mw: 0.0 — NO LOW SCENARIO | High Hazard Mw: 9.5

Segment G = Lesser Sunda Islands (io54–io69). No historical megathrust → Low scenario undefined. High α = 17.502.

LOW — NOT DEFINED (Low Mw = 0.0, no historical record)

```
[NOT DEFINED — Low hazard Mw = 0.0 for Segment G. No historical megathrust earthquake
recorded. This segment is excluded from the Low Hazard map per Burbidge et al. (2009).]
```

HIGH (Mw 9.5 — uniform α 17.502)

```
17.502*io54c+17.502*io54b+17.502*io54a+17.502*io54z+17.502*io54y+17.502*io54x+17.502*io54
w+17.502*io55b+17.502*io55a+17.502*io55z+17.502*io55y+17.502*io55x+17.502*io55w+17.502*io
56b+17.502*io56a+17.502*io56z+17.502*io56y+17.502*io56x+17.502*io56w+17.502*io57b+17.502*
io57a+17.502*io57z+17.502*io57y+17.502*io57x+17.502*io57w+17.502*io58b+17.502*io58a+17.50
2*io58z+17.502*io58y+17.502*io58x+17.502*io58w+17.502*io59b+17.502*io59a+17.502*io59z+17.
502*io59y+17.502*io59x+17.502*io59w+17.502*io60b+17.502*io60a+17.502*io61b+17.502*io61a+1
7.502*io62b+17.502*io62a+17.502*io63b+17.502*io63a+17.502*io64b+17.502*io64a+17.502*io65b
+17.502*io65a+17.502*io66b+17.502*io66a+17.502*io67b+17.502*io67a+17.502*io68b+17.502*io6
8a+17.502*io69b+17.502*io69a
```

MAKRAN SUBDUCTION ZONE

Unit sources mk1–mk10 | mk1–mk5 = Eastern Makran (1945 rupture zone); mk6–mk10 = Western Makran (1483 unknown event)

Segment H — Historical: unknown (1483)

Low Hazard Mw: 0.0 — NO LOW SCENARIO | High Hazard Mw: 9.1

Segment H = Western Makran (mk6–mk10 × 2 rows: b, a). No Low scenario (magnitude unknown). Historical Mw 8.1 scenario; tapering at eastern edge: mk10b=0.045, mk10a=0.177. High α = 25.059.

LOW — NOT DEFINED (Low Mw = 0.0, magnitude unknown for 1483 event)

```
[NOT DEFINED — Low hazard Mw = 0.0 for Segment H. The 1483 event magnitude is unknown.
Excluded from Low Hazard map per Burbidge et al. (2009).]
```

HIGH (Mw 9.1 — uniform α 25.059)

```
25.059*mk6b+25.059*mk6a+25.059*mk7b+25.059*mk7a+25.059*mk8b+25.059*mk8a+25.059*mk9b+25.05
9*mk9a+25.059*mk10b+25.059*mk10a
```

12.530*mk1b+12.530*mk1a+12.530*mk2b+12.530*mk2a+12.530*mk3b+12.530*mk3a+12.530*mk4b+12.530*mk4a+12.530*mk5b+12.530*mk5a+12.530*mk6b+12.530*mk6a+12.530*mk7b+12.530*mk7a+12.530*mk8b+12.530*mk8a+12.530*mk9b+12.530*mk9a+12.530*mk10b+12.530*mk10a

Segment I — Historical: 8.1 (1945)

Low Hazard Mw: 8.2 | High Hazard Mw: 9.1

Segment I = Eastern Makran (mk1–mk5 × 2 rows: b, a). 1945 Balochistan earthquake. Two historical scenarios (Mw 8.1 and 8.3 — reflecting magnitude uncertainty). Non-uniform slip in Mw 8.3: mk5b=5.610 (highest slip patch near 1945 epicentre); mk1b=0.016 (eastern taper).

HISTORICAL Mw 8.1 — uniform α 0.792

```
0.792*mk1b+0.792*mk1a+0.792*mk2b+0.792*mk2a+0.792*mk3b+0.792*mk3a+0.792*mk4b+0.792*mk4a+0
.792*mk5b+0.792*mk5a
```

LOW (Mw 8.2 — uniform α 1.119)

```
1.119*mk1b+1.119*mk1a+1.119*mk2b+1.119*mk2a+1.119*mk3b+1.119*mk3a+1.119*mk4b+1.119*mk4a+1
.119*mk5b+1.119*mk5a
```

HIGH (Mw 9.1 — uniform α 25.059)

```
25.059*mk1b+25.059*mk1a+25.059*mk2b+25.059*mk2a+25.059*mk3b+25.059*mk3a+25.059*mk4b+25.05
9*mk4a+25.059*mk5b+25.059*mk5a
```

12.530*mk1b+12.530*mk1a+12.530*mk2b+12.530*mk2a+12.530*mk3b+12.530*mk3a+12.530*mk4b+12.530*mk4a+12.530*mk5b+12.530*mk5a+12.530*mk6b+12.530*mk6a+12.530*mk7b+12.530*mk7a+12.530*mk8b+12.530*mk8a+12.530*mk9b+12.530*mk9a+12.530*mk10b+12.530*mk10a

SOUTH SANDWICH ARC

Unit sources ss4–ss11 × 4 rows (c, b, a, z). No historical megathrust record. No Low scenario (Low Mw = 0.0).

Segment SS — Historical: none (0)

Low Hazard Mw: 0.0 — NO LOW SCENARIO | High Hazard Mw: 9.0

ss4–ss11 = 8 along-strike positions × 4 rows. Historical Mw 8.6 scenario: non-uniform slip at ss9a = 7.924 (maximum slip patch). High α = 5.544 (Mw 9.0).

LOW — NOT DEFINED (no historical record; Low Mw = 0.0)

```
[NOT DEFINED — Low hazard Mw = 0.0 for South Sandwich. No known megathrust earthquake.
Excluded from Low Hazard map per Burbidge et al. (2009).]
```

HIGH (Mw 9.0 — uniform α 5.544)

```
5.544*ss4c+5.544*ss4b+5.544*ss4a+5.544*ss4z+5.544*ss5c+5.544*ss5b+5.544*ss5a+5.544*ss5z+5
.544*ss6c+5.544*ss6b+5.544*ss6a+5.544*ss6z+5.544*ss7c+5.544*ss7b+5.544*ss7a+5.544*ss7z+5.
544*ss8c+5.544*ss8b+5.544*ss8a+5.544*ss8z+5.544*ss9c+5.544*ss9b+5.544*ss9a+5.544*ss9z+5.5
44*ss10c+5.544*ss10b+5.544*ss10a+5.544*ss10z+5.544*ss11c+5.544*ss11b+5.544*ss11a+5.544*ss
11z
```

Reference

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