

## Supplemental Material to :

# Development and Comparison of 3D Seismic Geology and Shear-wave Velocity Models of Metro Vancouver

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### Supplemental Table 1:

Sample records of Collar and Survey records input for 3D Geomodelling

| Drillhole | Collar   |         |                  |                 | Survey          |            |                |
|-----------|----------|---------|------------------|-----------------|-----------------|------------|----------------|
|           | UTM X    | UTM Y   | Elevation<br>(m) | Max<br>Depth(m) | Distance<br>(m) | Dip<br>(°) | Azimuth<br>(°) |
| ANN       | 505174.3 | 5447579 | 9                | 1000            | 1000            | 90         | 0              |
| ARN       | 496933.6 | 5437573 | 5                | 1000            | 1000            | 90         | 0              |
| Durland   | 520697.1 | 5454550 | 3                | 1000            | 1000            | 90         | 0              |
| Dynamic   | 502989   | 5435589 | 4                | 600             | 600             | 90         | 0              |
| EBT       | 493418.2 | 5428349 | 56               | 1000            | 1000            | 90         | 0              |
| RAN10001  | 494884.1 | 5433500 | 5                | 1000            | 1000            | 90         | 0              |
| RAN10002  | 494504.2 | 5433480 | 1                | 1000            | 1000            | 90         | 0              |
| RAN10003  | 485704.2 | 5444701 | 2                | 1000            | 1000            | 90         | 0              |
| RAN10004  | 492154   | 5434305 | 2                | 1000            | 1000            | 90         | 0              |
| RAN10005  | 491983.7 | 5433105 | 4                | 1000            | 1000            | 90         | 0              |
| RAN10006  | 496653.8 | 5433395 | 6                | 1000            | 1000            | 90         | 0              |
| RAN10007  | 495098.7 | 5434100 | 3                | 1000            | 1000            | 90         | 0              |
| RAN10008  | 493577.7 | 5433430 | 4                | 1000            | 1000            | 90         | 0              |
| RAN10009  | 494143.8 | 5431245 | 3                | 1000            | 1000            | 90         | 0              |
| RAN10010  | 485804.6 | 5443745 | 3                | 1000            | 1000            | 90         | 0              |
| RAN10011  | 492992   | 5435000 | 2                | 1000            | 1000            | 90         | 0              |
| RAN10012  | 491704.1 | 5436074 | 0                | 1000            | 1000            | 90         | 0              |
| RAN10013  | 490403.7 | 5433817 | 2                | 1000            | 1000            | 90         | 0              |
| RAN10014  | 491654.2 | 5440817 | 1                | 1000            | 1000            | 90         | 0              |
| RAN10015  | 486004.4 | 5446342 | 4                | 1000            | 1000            | 90         | 0              |
| RAN10016  | 493804.1 | 5441500 | 8                | 1000            | 1000            | 90         | 0              |
| RAN10017  | 489654.2 | 5441817 | 2                | 1000            | 1000            | 90         | 0              |
| RAN10018  | 492604.2 | 5446298 | 9                | 1000            | 1000            | 90         | 0              |

**Supplementary Table 2:**

*Sample of borehole lithology data used for developing the 3D seismic geology model.*

| <b>Drill Hole</b> | <b>From</b> | <b>To</b> | <b>Name</b> | <b>Group</b> |
|-------------------|-------------|-----------|-------------|--------------|
| ANN               | 0           | 66        | Postglacial | Postglacial  |
| ANN               | 66          | 150       | Glacial     | Glacial      |
| ANN               | 150         | 1000      | CTB         | Bedrock      |
| ARN               | 0           | 350       | Postglacial | Postglacial  |
| ARN               | 350         | 550       | Glacial     | Glacial      |
| ARN               | 550         | 1000      | CTB         | Bedrock      |
| Durland Pitt      | 762         | 1000      | CTB         | Bedrock      |
| Dynamic Waver     | 0           | 212       | Postglacial | Postglacial  |
| Dynamic Waver     | 212         | 590       | Glacial     | Glacial      |
| Dynamic Waver     | 590         | 600       | CTB         | Bedrock      |
| EBT               | 0           | 550       | Glacial     | Glacial      |
| EBT               | 550         | 1000      | CTB         | Bedrock      |
| RAN10001          | 0           | 166       | Postglacial | Postglacial  |
| RAN10001          | 166         | 543       | Glacial     | Glacial      |
| RAN10001          | 543         | 1000      | CTB         | Bedrock      |
| RAN10002          | 0           | 139       | Postglacial | Postglacial  |
| RAN10002          | 139         | 536       | Glacial     | Glacial      |
| RAN10002          | 536         | 1000      | CTB         | Bedrock      |
| RAN10003          | 0           | 178       | Postglacial | Postglacial  |
| RAN10003          | 178         | 482       | Glacial     | Glacial      |
| RAN10003          | 482         | 1000      | CTB         | Bedrock      |
| RAN10004          | 0           | 138       | Postglacial | Postglacial  |
| RAN10004          | 138         | 645       | Glacial     | Glacial      |
| RAN10004          | 645         | 1000      | CTB         | Bedrock      |
| RAN10005          | 0           | 69        | Postglacial | Postglacial  |
| RAN10005          | 69          | 503       | Glacial     | Glacial      |
| RAN10005          | 503         | 1000      | CTB         | Bedrock      |

**Supplementary Table 3:**

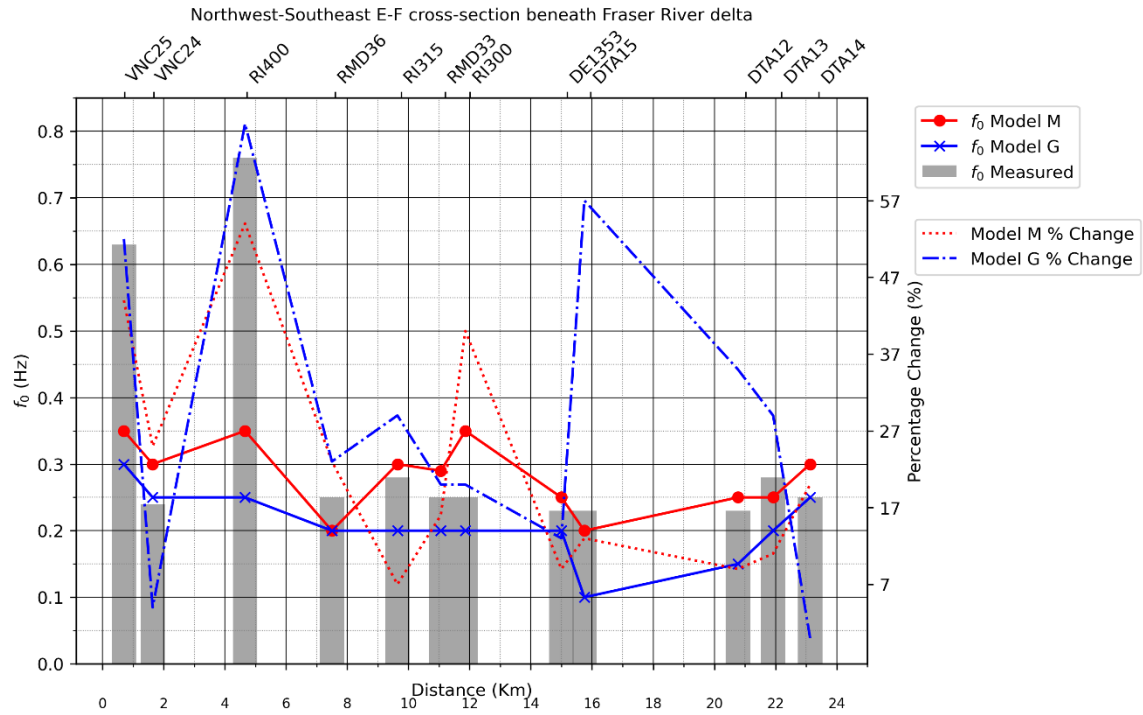
*Evaluation of  $f_{0(HV)}$  for 12 sites along West-East cross-section C-D beneath the Fraser River delta. Blue/Green shading indicates over /under estimation*

| Site   | $f_{0(HV)}$ | Model M | Abs. Change | % Change | Model G | Abs. Change | % Change |
|--------|-------------|---------|-------------|----------|---------|-------------|----------|
| RI351  | 0.23        | 0.29    | 0.06        | 26%      | 0.26    | 0.03        | 13%      |
| RI343  | 0.3         | 0.3     | 0           | 0%       | 0.25    | 0.05        | 17%      |
| RMD06  | 0.23        | 0.2     | 0.03        | 13%      | 0.25    | 0.02        | 9%       |
| RMD62  | 0.21        | 0.25    | 0.04        | 19%      | 0.15    | 0.06        | 29%      |
| RMD04  | 0.23        | 0.25    | 0.02        | 9%       | 0.25    | 0.02        | 9%       |
| RMD31  | 0.21        | 0.21    | 0           | 0%       | 0.2     | 0.01        | 5%       |
| RI377  | 0.28        | 0.2     | 0.08        | 29%      | 0.25    | 0.03        | 11%      |
| RMD61  | 0.25        | 0.2     | 0.05        | 20%      | 0.25    | 0           | 0%       |
| RMD57  | 0.32        | 0.31    | 0.01        | 3%       | 0.3     | 0.02        | 6%       |
| RI375  | 0.94        | 0.3     | 0.64        | 68%      | 0.35    | 0.59        | 63%      |
| RI376  | 0.67        | 0.25    | 0.42        | 63%      | 0.35    | 0.32        | 48%      |
| RMD054 | 0.31        | 0.3     | 0.01        | 3%       | 0.35    | 0.04        | 13%      |
|        | Average     |         | 0.11        | 21%      |         | 0.10        | 18%      |
|        | Std.Dev     |         | 0.19        | 22%      |         | 0.17        | 18%      |

**Supplementary Table 4**

*Evaluation of  $f_{0HV}$  for 12 sites along Northwest-Southeast cross-section E-F beneath Fraser River delta. Blue/Green shading indicates over/under estimation of  $f_{0HV}$ .*

| Site   | $f_{0HV}$ | Model M | Abs. Change | % Change | Model G | Abs. Change | % Change |
|--------|-----------|---------|-------------|----------|---------|-------------|----------|
| VNC25  | 0.63      | 0.35    | 0.28        | 44%      | 0.3     | 0.33        | 52%      |
| VNC24  | 0.24      | 0.3     | 0.06        | 25%      | 0.25    | 0.01        | 4%       |
| RI400  | 0.76      | 0.35    | 0.41        | 54%      | 0.25    | 0.51        | 67%      |
| RMD36  | 0.25      | 0.2     | 0.06        | 23%      | 0.2     | 0.06        | 23%      |
| RI315  | 0.28      | 0.3     | 0.02        | 7%       | 0.2     | 0.08        | 29%      |
| RMD33  | 0.25      | 0.29    | 0.04        | 16%      | 0.2     | 0.05        | 20%      |
| RI300  | 0.25      | 0.35    | 0.1         | 40%      | 0.2     | 0.05        | 20%      |
| DE1353 | 0.23      | 0.25    | 0.02        | 9%       | 0.2     | 0.03        | 13%      |
| DTA15  | 0.23      | 0.2     | 0.03        | 13%      | 0.1     | 0.13        | 57%      |
| DTA12  | 0.23      | 0.25    | 0.02        | 9%       | 0.15    | 0.08        | 35%      |
| DTA13  | 0.28      | 0.25    | 0.03        | 11%      | 0.2     | 0.08        | 29%      |
| DTA14  | 0.25      | 0.3     | 0.05        | 20%      | 0.25    | 0           | 0%       |
|        | Average   |         | 0.09        | 23%      |         | 0.12        | 29%      |
|        | Std.Dev.  |         | 0.12        | 15%      |         | 0.14        | 20%      |

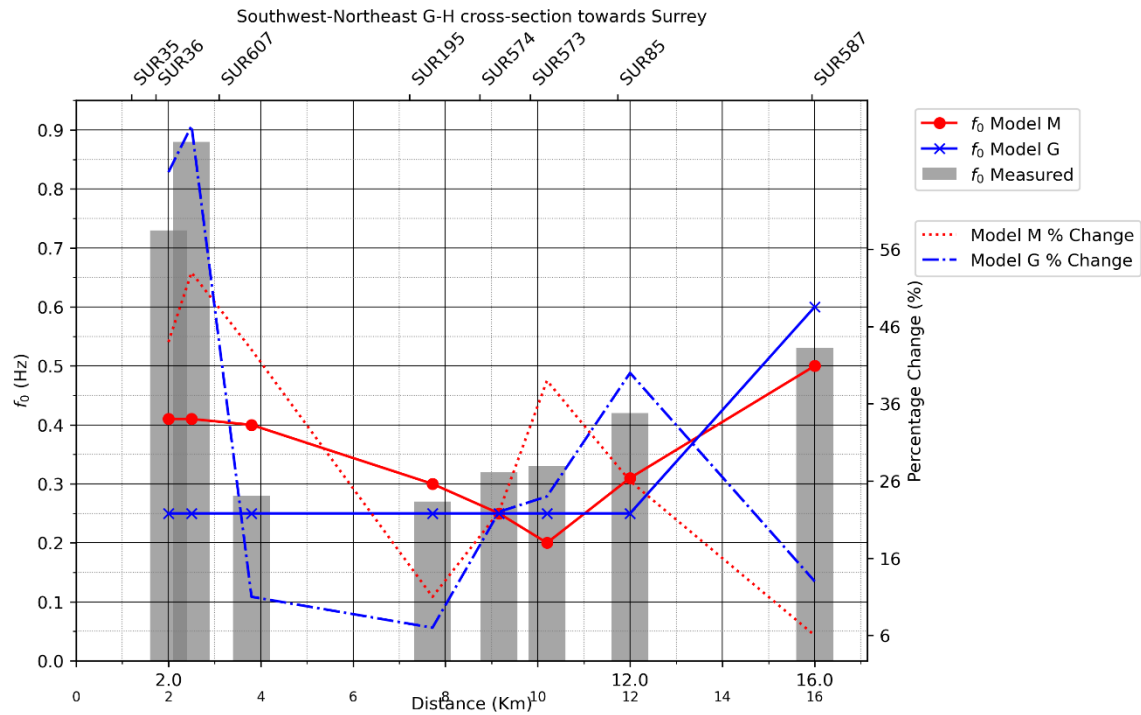


**Supplementary Figure 1 Evaluation of  $f_{0HV}$  along Northwest-Southeast cross-section E-F beneath Fraser River delta**

**Supplementary Table 5:**

Evaluation of  $f_{0HV}$  for 8 sites along Southwest-Northeast G-H cross-section towards Surrey. Blue/Green shading indicates over/under estimation of  $f_{0HV}$ .

| Site   | $f_{0HV}$ | Model M | Abs. Change | % Change | Model G | Abs. Change | % Change |
|--------|-----------|---------|-------------|----------|---------|-------------|----------|
| SUR35  | 0.73      | 0.41    | 0.32        | 44%      | 0.25    | 0.48        | 66%      |
| SUR36  | 0.88      | 0.41    | 0.47        | 53%      | 0.25    | 0.63        | 72%      |
| SUR607 | 0.28      | 0.4     | 0.12        | 43%      | 0.25    | 0.03        | 11%      |
| SUR195 | 0.27      | 0.3     | 0.03        | 11%      | 0.25    | 0.02        | 7%       |
| SUR574 | 0.32      | 0.25    | 0.07        | 22%      | 0.25    | 0.07        | 22%      |
| SUR573 | 0.33      | 0.2     | 0.13        | 39%      | 0.25    | 0.08        | 24%      |
| SUR85  | 0.42      | 0.31    | 0.11        | 26%      | 0.25    | 0.17        | 40%      |
| SUR587 | 0.53      | 0.5     | 0.03        | 6%       | 0.6     | 0.07        | 13%      |
|        | Average   |         | 0.16        | 31%      |         | 0.19        | 32%      |
|        | Std.Dev.  |         | 0.15        | 16%      |         | 0.20        | 22%      |

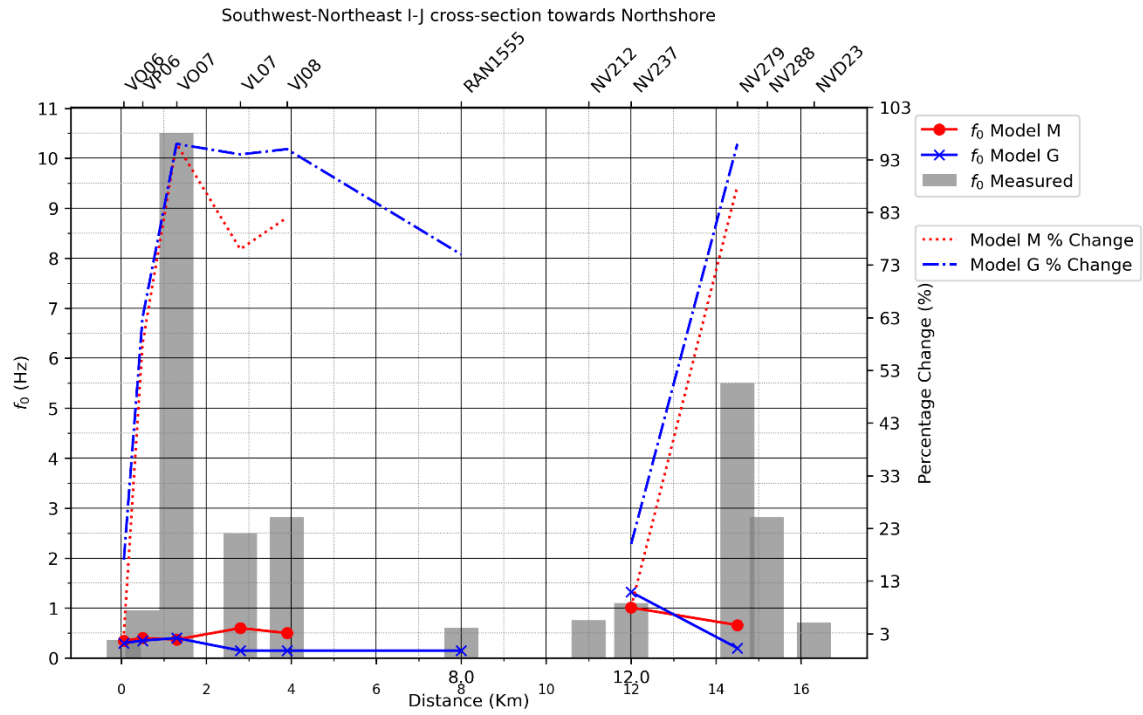


**Supplementary Figure 2 Evaluation of  $f_{0HV}$  along Southwest-Northeast G-H cross-section towards Surrey**

**Supplementary Table 6:**

Evaluation of  $f_{0HV}$  for 11 sites along Southwest-Northeast I-J cross-section towards Northshore. Blue/Green shading indicates over/under estimation of  $f_{0HV}$ .

| Site    | $f_{0HV}$ | Model M | Abs. Change | % Change | Model G | Abs. Change | % Change |
|---------|-----------|---------|-------------|----------|---------|-------------|----------|
| VQ06    | 0.36      | 0.35    | 0.01        | 3%       | 0.3     | 0.06        | 17%      |
| VP06    | 0.95      | 0.4     | 0.55        | 58%      | 0.35    | 0.6         | 63%      |
| VO07    | 10.5      | 0.37    | 10.13       | 96%      | 0.4     | 10.1        | 96%      |
| VL07    | 2.5       | 0.6     | 1.9         | 76%      | 0.15    | 2.35        | 94%      |
| VJ08    | 2.82      | 0.5     | 2.32        | 82%      | 0.15    | 2.67        | 95%      |
| RAN1555 | 0.6       |         |             |          | 0.15    | 0.45        | 75%      |
| NV212   | 0.76      |         |             |          |         |             |          |
| NV237   | 1.1       | 1.01    | 0.09        | 8%       | 1.32    | 0.22        | 20%      |
| NV279   | 5.5       | 0.66    | 4.84        | 88%      | 0.2     | 5.3         | 96%      |
| NV288   | 2.82      |         |             |          |         |             |          |
| NVD23   | 0.71      |         |             |          |         |             |          |
|         | Average   |         | 2.83        | 59%      |         | 2.72        | 70%      |
|         | Std.Dev.  |         | 3.36        | 35%      |         | 3.24        | 32%      |



**Supplementary Figure 3 Evaluation of  $f_{0HV}$  along Southwest-Northeast I-J cross-section towards Northshore.**