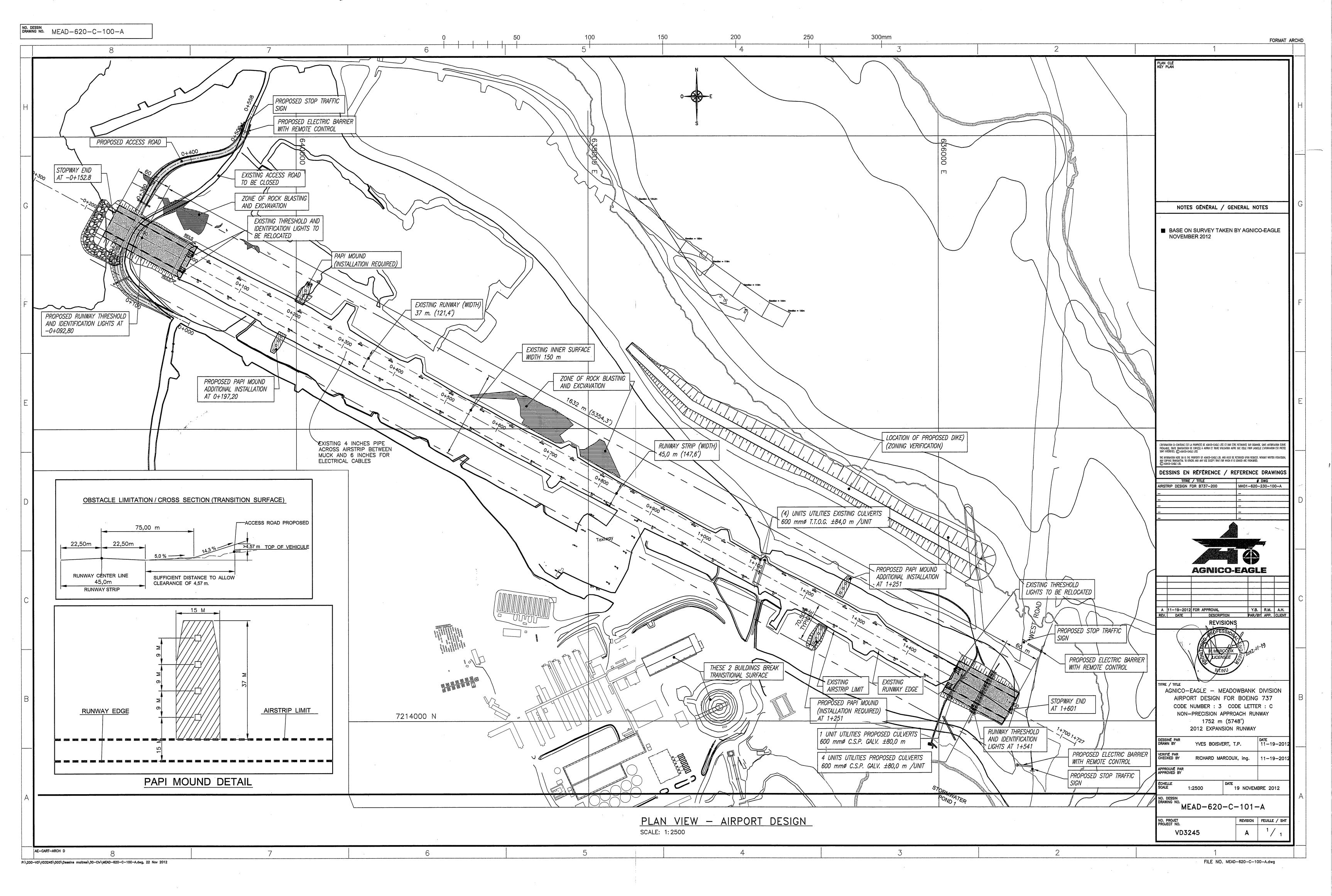
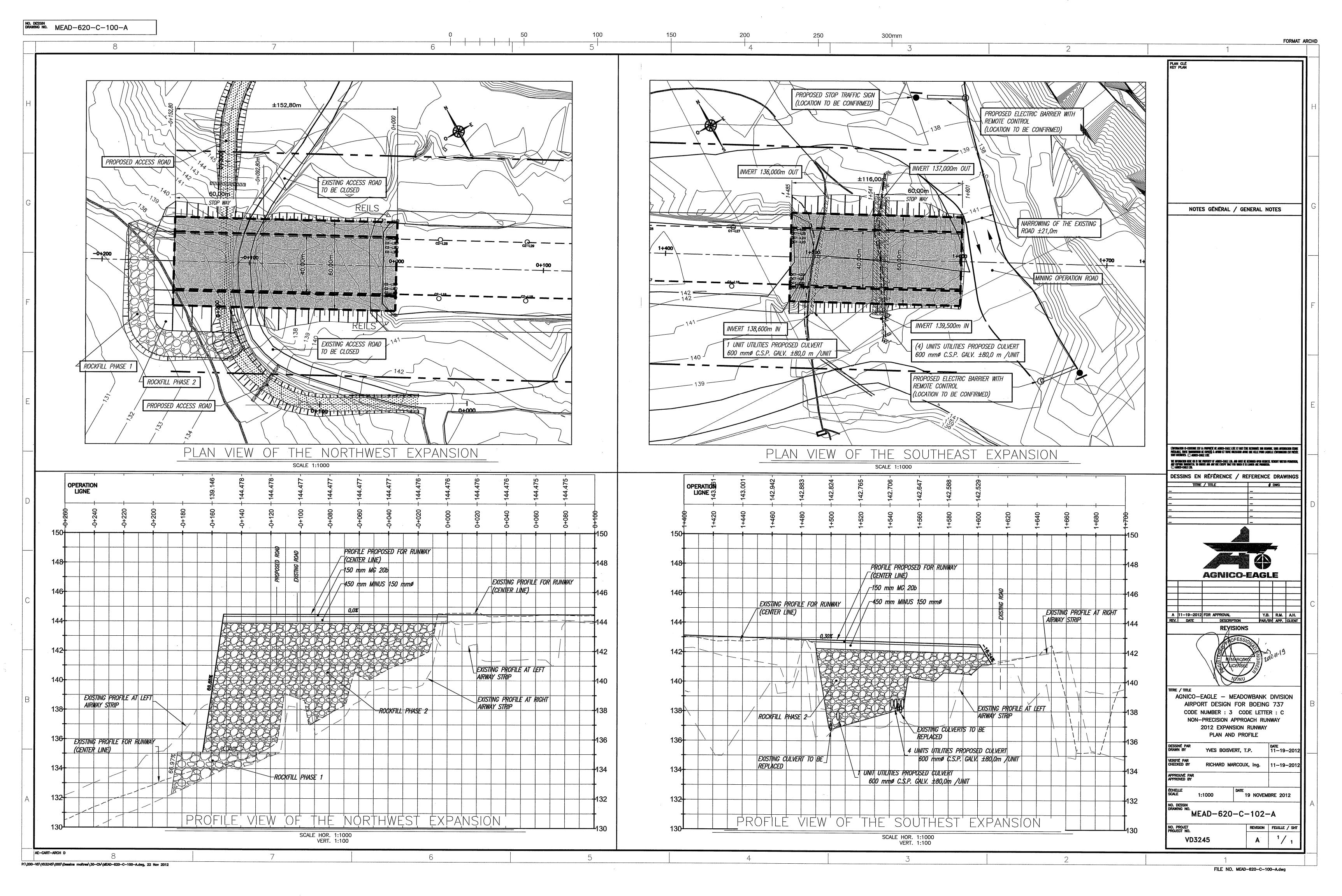
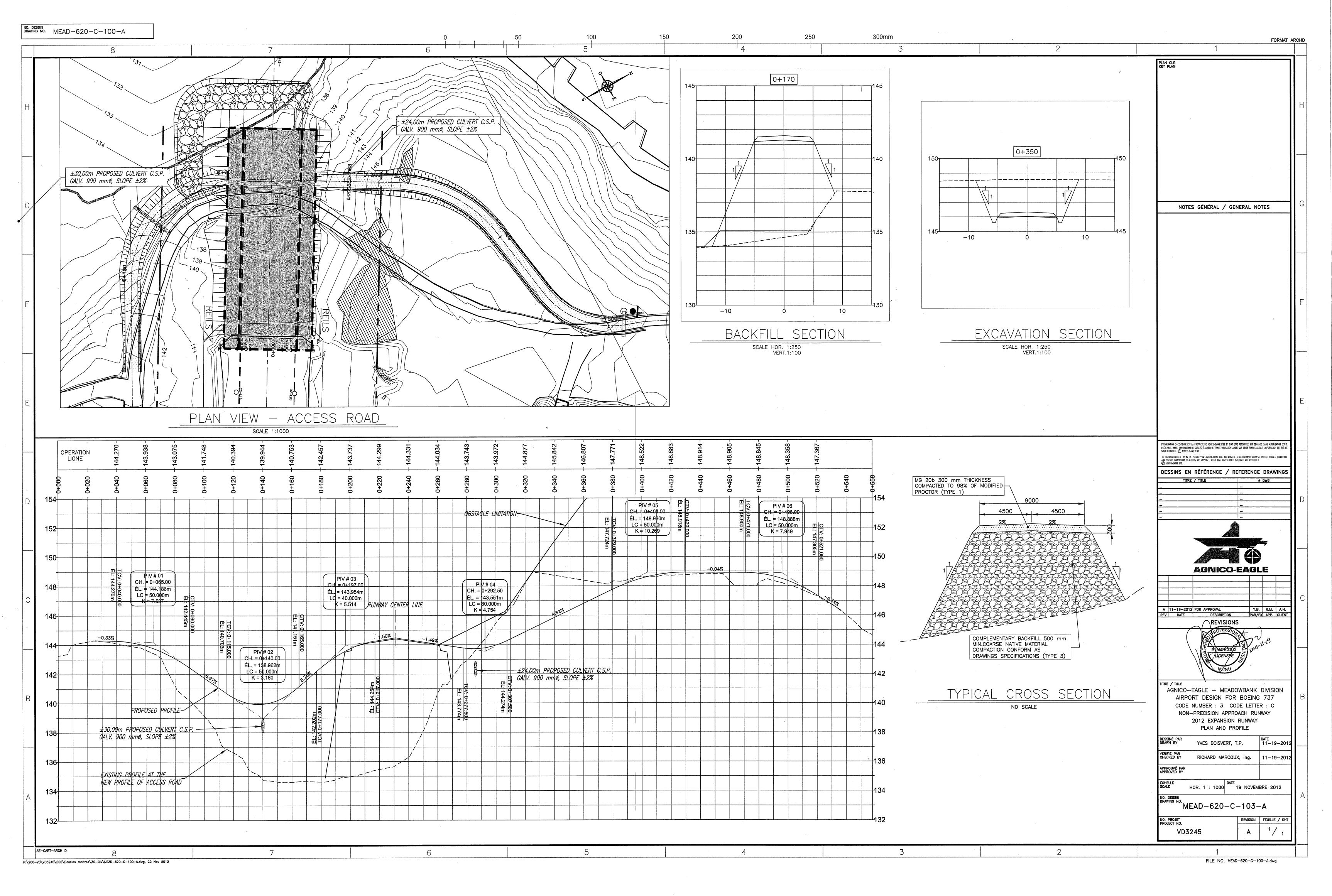
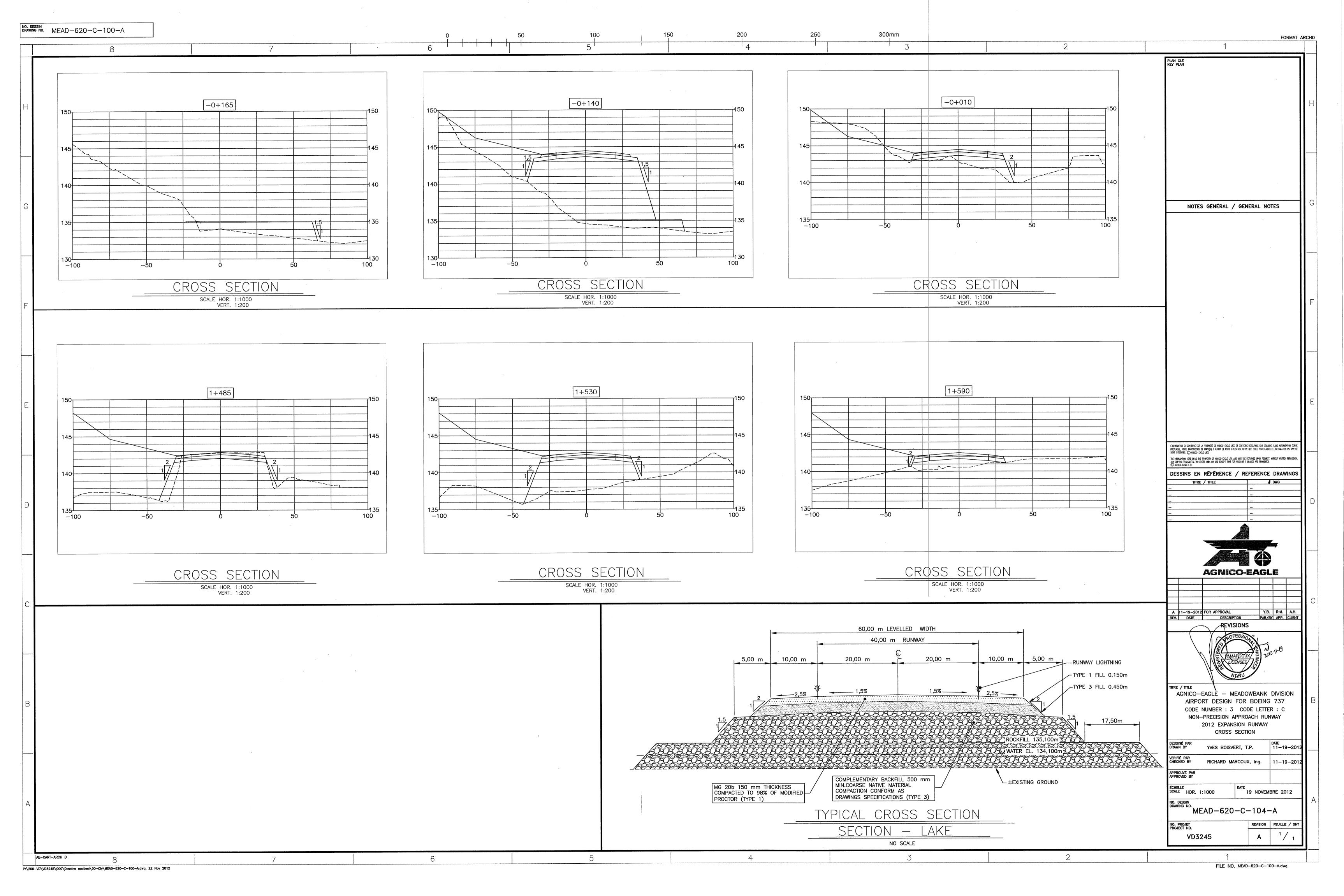


Appendix E – Airstrip drawing









1.1 Products

1. "Organic Materials" are the naturally occurring organic rich, A-Horizon soils found at ground surface and may include topsoil and/or fibrous peat

1.2 Execution

1. Salvage Organic Materials by excavation and loading for transport from Work Site area(s) designated by the Owner's

2. Excavation of Organic Materials may require the use of drilling, blasting, ripping and or other approved techniques to prepare

3. Organic Materials encountered within the Work Site areas of less than 0.1 m measured thickness are considered impractical to

salvage and may be incorporated as part of the common excavation.

4. Haul and stockpile Organic Materials in area(s) designated on the Drawings and/or by the Owner's Representative. 5. Shape stockpile(s) of Organic Materials to smooth, uniform surface with side slopes not steeper than three horizontal to one

2. FOUNDATION PREPARATION

the Organic Materials for salvaging.

2.1 Products

vertical (3H:1V).

1. "Unsuitable Materials" include ice, snow, topsoil, organic soils, vegetation, boulders, etc. to a depth or in a location that will impede the removal of the competent materials. Unsuitable Material may be frozen in situ depending on time of year and/or ground ice conditions. Within the foundation preparation limits of the embankments, Unsuitable Materials may include Mineral Soil that has a high silt, clay and/or ice content.

2. "Competent Materials" may include Mineral Soil overburden material and the underlying Bedrock formation as defined in Section 3 "BULK EXCAVATION."

3. Determination of Unsuitable Materials and Competent Materials will be at the discretion of the Owner's Representative, as recommended by the Geotechnical Engineer. The Contractor may be required to assist during the determination by performing such work as proof rolling, test pit excavation and the like as directed by the Owner's Representative.

2.2 Execution

Salvage and Stockpile Organic Materials, as outlined in Section 1, to be performed.

2. Remove Unsuitable Materials in areas indicated on the Drawings or as per the Owner's Representative and to the limits of

3. In areas where Unsuitable Materials within the limits of the Work are encountered, the Contractor may be requested to advance test pit excavations as directed by the Owner's Representative to delineate the extent of the deposits. The materials encountered will be inspected by the Geotechnical Engineer. A determination of Competent Materials of the excavated and underlying materials shall be made by the Owner's Representative using recommendations provided by the Geotechnical Engineer.

Specifications. Acceptance of foundation preparation shall be performed by the Owner's Representative using recommendations provided by the Geotechnical Engineer.

4. The Contractor shall allow the Geotechnical Engineer to review the prepared foundation to evaluate conformance to the

5. Stockpile excavated material which is considered by the Owner's Representative suitable for reuse as Fill Material (as defined in Section 3 "BULK EXCAVATION") at a location.

6. Stockpile excavated material which is considered by the Owner's Representative unsuitable for embankment construction at a location indicated on the Drawings or as directed by the Owner's Representative.

3. BULK EXCAVATION

 "Mineral Soil" is the near surface layer of earth materials generally composed of till-like soil, including but not limited to varying proportions of sand, gravel, silt, clay cobbles and boulders. Thawed Mineral Soil materials are normally suitable for mechanical excavation. Frozen Mineral Soil materials may require the use of drilling, blasting, ripping and or other approved techniques to prepare the Mineral Soil materials for excavation.

that will require the use of drilling, blasting, ripping and/or other approved techniques to prepare the Bedrock materials for

3.2 Execution

1. Salvage and Stockpile Organic Materials, as outlined in Section 2, to be performed

2. Excavate from available areas of cut along the airstrip alignment to the elevations and profile shown on the Drawings or from approved local borrow areas adjacent to the proposed airstrip. Excavation of Mineral Soil and Bedrock are expected.

3. Haul and place the bulk excavation materials according to the technical specifications defined in Section 6 or stockpile Mineral Soil and Bedrock in area(s) designated by the Owner's Representative.

4. Where frozen soils are encountered, they shall be excavated using methods that conform to all applicable laws and regulations and to proven safe practices. The proposed method shall be submitted to the Engineer in writing for review and approval at least two weeks prior to beginning such excavation.

5. Where blasting is required, all operations in connection with transporting, storage and use of explosives shall be subject to the rules and regulations of governing authorities. Only perform blasting using experienced and licensed personnel. Obtain prior approval of the Owner for blasting operations.

6. Blast and remove Bedrock to the depths and profiles shown on the Drawings.

environmental or other reasons defined by the Owner.

7. Shape Mineral Soil and or Bedrock subgrade to uniformly graded surfaces intended to minimize ponding of water within the

drainage ditch as defined on the Drawings and to the satisfaction of the Owner's Representative. 8. Final cut slopes in Mineral Soil shall be trimmed no steeper than 3 Horizontal to 1 Vertical. Cut slopes in areas of peat or any

soft or weak soil(s) may require flatter slopes, as determined by the Geotechnical Engineer. 9. Final cut slopes in bedrock shall be no steeper than 0.5 Horizontal to 1 Vertical. Flatter slopes may be required for

4. BACKFILL MATERIALS

<u>4.1 General</u>

1. Two structural fill types shall be used to construct the airstrip as follows:

a. Type 1 Fill - MG 20b Granular Surfacing;

b. Type 2 Fill - Minus 150mm Fine Native Material: and c. Type 3 Fill - Minus 500 mm Coarse Native Material.

4.2 Type 1 Fill – MG 20b Granular Surfacing

1. Type 1 Fill shall consist of fragments of hard, durable rock, and meet the gradation specification in Table 1.

Table 1	l: Type 1 Fill Grad	ation Specification
	Sieve Designation	Per cent by Weight Passing
	31,5 mm	100%
	20 mm	90-100%
	14 mm	68-93%
	5 mm	35-60%
	315 <i>μ</i> m	9-17%
	80 <i>μ</i> m	5-11%

2. Type 1 material shall be placed with a moisture content within + 2% of the optimum moisture content, as determined by the

4.3 Type 2 Fill - Minus 150 mm Fine Native Material

1. Type 2 Fill shall consist of native mineral soil, bedrock and/or quarried rock fill materials excavated from cut areas or local borrow areas. The maximum particle diameter shall be 150 mm, and meet the gradation specification in Table 2.

Table 2: Type 2 Fill Gradation Specification

abic 2. Type 2.1 iii Gradation Opecinication					
	Sieve Designation	Per cent by Weight Passing			
	150 mm	100%			
	50 mm	70-100%			
	25 mm	50-100%			
	4.75 mm	25-100%			
	2 mm	10-80%			
	0.075 mm	0-10%			

2. Care shall be taken to place the Type 2 Fill material within approximately + 4% of the optimum moisture content. If frozen material is worked until thawed, special attention must be given to observing the moisture content. Material that is visibly too wet, as determined by the Engineer, shall not be incorporated into the airstrip embankment fill, and shall be place in a designated stockpile area.

4.4 Type 3 Fill – Minus 500 mm Coarse Native Material

1. Type 3 Fill shall consist of native mineral soil, bedrock and/or quarried rock fill materials excavated from cut areas or local borrow areas. The maximum particle diameter shall be 500 mm, and meet the gradation specification in Table 3.

2. Care shall be taken to place the Type 3 material within approximately + 4% of the optimum moisture content. If frozen material is worked until thawed, special attention must be given to observing the moisture content. Material that is visibly too wet, as determined by the Engineer, shall not be incorporated into the airstrip embankment fill, and shall be placed in a designated

Table 2: Type 3 Fill Gradation Specification

Sieve	Per cent by
Designation	Weight
	Passing
500 mm	100%
300 mm	85-100%
100 mm	60-100%
25 mm	45-90%
4.75 mm	25-70%
0.850 mm	10-30%
0.425 mm	5-20%
0.180 mm	0-10%
0.075 mm	0-10%

4.5 Oversize Particles

1. Oversize particles are considered to be rock fragments with a diameter greater than 500 mm. Where oversize particles are encountered, the particles shall be selectively removed from the Type 2 and 3 Fill materials prior to compaction.

2. Oversize particles shall be incorporated in the production of Type 1 Fill and/or salvaged and stockpiled in a designated locations approved by the Owner's Representative.

4.6 Placement and Compaction

1. Backfill materials including rock fill and granular fill materials, should be placed in loose lifts not exceeding 150 mm in thickness, unless otherwise noted, and all granular fills should be moisture conditioned, if required, prior to compaction. Type 3 Fill shall be placed in loose lifts not exceeding 500 mm thickness. Water should be added to adjust the in situ moisture content to within 2 per cent of the optimum moisture content, as determined by the Proctor density – moisture relationship.

2. Backfill materials should be placed so as to minimize disturbance of the subgrade.

3. Compaction of Type 1 Fill material shall be obtained using a 3.5-tonne smoothdrum vibratory compactor. The compactor shall maintain a minimum 0.2 m overlap between passes. Carry out rolling over large surfaces and execute turns carefully to obtain uniform compaction.

4. Compaction of Types 2 and 3 Fill materials shall be obtained using the smooth drum vibrator roller and/or load and unloaded haul trucks. The trucks shall take care to traffic over the entire working surface of each lift. Where required, the Geotechnical Engineer shall indicate where additional compaction traffic is required.

5. Place and compact fill materials in horizontal lifts beginning in the lowest area of the foundations unless specified otherwise

6. All lifts must pass density and gradation requirements prior to placement of subsequent lift.

7. All lifts shall be uniformly compacted using a smooth drum 3.5 tonne vibratory roller to the following in situ density:

a. Type 1 Fill: Granular base should be compacted to 100 per cent of the standard Proctor maximum dry density, as determined by ASTM Test Method D698-70.

b. Type 2 Fill: Fine Native Material should be compacted to 98 per cent of the standard Proctor maximum dry density and

to 100 per cent within 300 mm of finished subgrade, as determined by ASTM Test Method D698-70. c. Type 3 Fill: Coarse Native Material should be compacted by a minimum of 6 complete passes of a smooth drum 3.5

tonne vibratory roller, or equivalent. 8. For each fill type, a Method Compaction Technique test fill will be completed onsite to determine the number of compactor passes required to meet placed fill density specifications and confirm the maximum lift thicknesses.

9. Test fills used for determining specifics of the method compaction technique, to the extent possible, will employ the compaction equipment and simulate placement methods proposed.

10. Wherever possible, the degree of compaction shall be evaluated by nuclear densometer testing.

11. The embankment fill surfaces should be sloped to provide positive drainage to the site perimeter. Perimeter ditches may be required to control surface water runoff from this area by directing the runoff to a designated sump location(s) for monitoring prior to treatment and discharging to the environment.

5. AIRSTRIP EMBANKMENT CONSTRUCTION

5.1 Products

1. "Mineral Soil" as defined in Section 3. "BULK EXCAVATION".

2. "Bedrock" as defined in Section 3. "BULK EXCAVATION".

3. "Fill Material" is non-frozen, excavated Mineral Soil, Bedrock, Run of Mine material, processed material and/or other approved imported fill material that is suitable for use in the embankments (Type 2 Fill is expected, as defined in Section 4. "BACKFILL

4. Fill Materials will be approved by the Owner's Representative, using recommendations provided by the Geotechnical Engineer, prior to usage by the Contractor

5.2 Execution

1. The airstrip embankment fills shall be constructed to the lines, grades and cross-sections shown on the Construction Drawings

2. Salvage and Stockpile Organic Materials, as outlined in Section 1. "SALVAGE AND STOCKPILE ORGANIC MATERIALS" to

3. Foundation Preparation, as outlined in Section 2. "FOUNDATION PREPARATION", to be performed. No Fill Materials to be placed on prepared foundation surface without approval from Owner's Representative.

4. Native Fill materials for construction of the airstrip embankment will be obtained preferentially from areas of cut. In the event that insufficient quantities of bulk excavation materials are available, local borrow areas may be developed, as approved by the Owner's Representative.

5. All embankment fills shall be placed and compacted in dry conditions at temperatures above 0°C. Granular surfacing materials may be placed at temperatures below 0°C, at the discretion of the Engineer.

6. The minimum in situ compacted thickness of fill placed at any fill areas shall consist of 300 mm of Type 1 Fill material and 500 mm of Type 2 Fill material.

7. In areas where the total thickness of the embankment fill is 600 mm or less, Type 1 Fill material shall be placed, after the geotextile membrane, in lifts not exceeding 300 mm compacted thickness and no Type 2 Fill material shall be placed. 8. In areas where the total thickness of embankment fill is greater than one meter, Type 2 Fill material shall be placed to within

about 300 mm of the finished subgrade surface of the airstrip embankment. The topmost lift of the Type 2 Fill material shall be of a noticeably finer gradation, as directed by the Geotechnical Engineer, in order to transition to geotextile membrane and the Type 1 9. Oversize Particles (greater than 500mm diameter) may be considered for placement at the base of deep embankment fills

where the embankment thickness is greater than 1.5 metres, subject to approval by the Owners Representative. Oversize Particles shall be 'scalped off' by blading them off the fill grade with a bulldozer and pushing ahead of the fill into the advancing

10. All embankment fill materials used for construction of the airstrip should comprise unfrozen materials, within the specified limits for particle size and moisture content.

11. Hauling and spreading equipment shall be routed approximately parallel to the axis of the embankment and the traffic patterns shall be varied to prevent rutting. Any damage to the embankment or to the Fill Materials already placed shall be repaired to the satisfaction of the Owner's Representative prior to the placement of the next lift. This may include, but shall not be limited to, the removal of ruts and repairs to fill boundaries.

12. Haul trucks should not follow existing tracks. If, however, rutting occurs, scarify and re-compact to produce an even surface. Develop a traffic pattern to achieve required densities to the satisfaction of the Owner's Representative.

13. Haul to designated fill placement area(s) within embankment footprint.

14. Adjacent lifts shall have a maximum elevation difference of one compacted lift thickness.

15. During dumping and spreading activities, remove any waste materials such as, but not limited to, debris, organics, vegetation or any other unsuitable material if such material has been transported into the working areas.

16. Spread Fill Material in even, horizontal lifts, of which the maximum loose lift thickness will be specified by the Owner's Representative based on the results of field compaction tests. The maximum loose lift thickness is expected to be in the order of 300 mm for suitable Mineral Soil materials and 500 mm for rock fill materials.

17. Oversize particles shall be removed. Where reduced lift thicknesses are required, particles larger than two-thirds (2/3) of the reduced lift thickness shall be removed prior to compaction. Requirements for reduced lift thicknesses shall be determined by the Owner's Representative.

18. Compaction to be performed using the smooth drum vibratory 3.5 tonne compactor and full-loaded Caterpillar 773 rock trucks. 19. When compacting Fill Materials, adjust the water content of the Fill Material to within 2% (by weight) of optimum water content.

20. Fill Material consisting of Mineral Soil shall be compacted to a minimum of 95% standard Proctor maximum dry density or as specified in Section 4. "BACKFILL MATERIALS". Fill Materials consisting of rock fill shall be compacted to a performance-based requirement. This compaction requirement shall be developed in the field as recommended by the Geotechnical Engineer. The resulting compaction achieved will be to the satisfaction of the Owner's Representative. The Contractor shall cooperate with the Geotechnical Engineer and the Owner's Representative to develop the performance-based requirement.

21. Water shall not be permitted to pond on surface. Ponded water should be removed from the fill.

22. Any Fill Material which has become saturated, softened, loosened or has undergone a reduction in density by precipitation. ponded water, construction traffic or frost action is to be excavated and replaced with suitable material. The Geotechnical Engineer shall identify areas in which material should be removed. This work shall be performed to the satisfaction of the Owner's Representative. The excavated material may be dried and/or thawed and used for fill upon approval from the Owner's

23. Shape the embankment to a dense, uniform surface free of ruts or loose material at a slope sufficient to promote free drainage

24. Slope exterior embankment surfaces to be plane and uniform and to the lines and grades shown on the Drawings. This will require the placement and compaction of Fill Material beyond the lines and grades shown on the Drawings followed by trimming to the said lines and grades.

25. Before suspension of operations each day or before inclement weather, the Fill Materials in place shall be compacted and the surface rolled smooth and crowned to facilitate free drainage of precipitation.

26. Where possible, Fill Material placed in the embankment shall be free from lenses, pockets or layers of materials which are significantly different in gradation from the surrounding material. The Contractor shall employ methods to limit the amount and limits of segregated materials. The Contractor shall work with the Geotechnical Engineer to develop such methods which may include, but not be limited to, the placement of parallel strips of Fill Material within a given lift and/or material blending. The Geotechnical Engineer shall provide recommendations to the Owner's Representative as to the acceptability of the results of the placed materials. Fill Material shall be placed to the satisfaction of the Owner's Representative.

6. GRANULAR PAVEMENT SURFACE CONSTRUCTION

1. "Type 1 Fill Material" as defined in Section 4.

300mm

1. The Contractor shall confirm the as-built surface of the embankment fill by survey prior to applying Type 1 Fill. Any

2. Spread Type 1 Fill Material in an even, horizontal lift, of which the maximum loose lift thickness will be specified by the Owner's

Representative based on the results of field compaction tests of the underlying embankment fill materials. 3. The maximum loose lift thickness is expected to be in the order of 400 mm for Type 1 Fill material to achieve a final in situ

4. Type 1 Fill is considered a processed material and shall be approved for placement by the Owner's Representative prior to construction. Therefore, Oversize Particles are not considered part of this application.

compacted thickness of 300 mm. However, greater thickness may be applied as directed by the Owner's Representative.

5. Compaction to be performed using the smooth drum vibratory 3.5 tonne compactor and full-loaded Caterpillar 773 rock trucks,

6. When compacting Type 1 Fill, adjust the water content of the Fill Material to within 2% (by weight) of optimum water content. 7. Compact Type 1 Fill in accordance with Section 4.

8. Shape the granular pavement surface to a dense, uniform surface free of ruts or loose material at a slope sufficient to promote free drainage of surface water at all times.

7. RUNOFF AND SEDIMENT CONTROL DITCHES AND MONITORING PONDS

1. Ditches shall be constructed as required to:

a. Capture runoff from areas impacted by construction activities; and

b. Promote drainage away from the as-constructed airstrip embankment, in the longer term.

discrepancies determined by the as-built survey shall be corrected prior to applying Type 1 Fill.

2. The locations and sizes of the ditches will be determined in the field by the Geotechnical Engineer. In general, ditches will have a minimum cross-sectional area of 1.0 m² and channel side slopes will not be steeper than 3 Horizontal to 1 Vertical.

3. Ditches shall be graded at a minimum 0.1% slope, or as directed by the Geotechnical Engineer, toward the monitoring ponds. 7.2 Monitoring Pond

1. Monitoring ponds shall be constructed to allow for sedimentation and visual observation of surface runoff water prior to discharge to the environment;

2. The monitoring pond shall be lined with a 150 mm thick layer of select Type 1 Fill material. The monitoring pond shall have minimum dimensions of 20 m length, 20 m width, and 0.5 m depth.

3. The exact location of the monitoring pond(s) will be determined by the Geotechnical Engineer during construction. The Pond shall be located at least 25 m away from settlement-sensitive structures.

4. Ditches and monitoring ponds shall be constructed and commissioned prior to beginning construction activities; 5. During the construction phase, monitoring will be limited to identifying suspended sediments in runoff discharge at the point of

6. If sediments are observed in discharge flows, immediate action shall be taken to mitigate sediment concentration to a nonobservable level, or the project permit levels;

7. The Monitoring Pond will be field fit during the course of construction, and will collect ditch flow at a common point. The Pond shall be of sufficient capacity to provide adequate residence time to the collected runoff for sedimentation to a degree so that

8. The details of erosion protection to minimize erosion and/or sedimentation will be determined during the course of construction;

9. One test pit will be excavated and geotechnically logged in an area of the pond foundation. The pond will not be placed over

thick peat deposit(s). 7.3 Access

1. Free, unrestricted access to the general open areas surrounding the developed site will not be available. Equipment movements and work operations shall be confined to the areas designated by the Owner's Representative

discharge from the Monitoring Pond contains little to no visible sediment in surface water runoff from the airstrip.

7.4 Temporary Protection of Works

release from the Monitoring Pond:

1. If a section of fill is to be left for a period of time (e.g., overnight) before subsequent lifts are placed, or when rain is imminent, roll smooth the surface of the top lift in order to promote drainage of surface water. Before restart of the Work on this section, scarify and re-compact, as directed by the Owner's Representative.

7.5 Weather

1. Do not place material when satisfactory work cannot be performed due to intense periods of inclement weather such as, rain. snow, extreme cold or any other unsatisfactory conditions.

8. SURVEY CONTROL 1. Sufficient survey control shall be provided to

a. Lay out the construction;

b. Measure as-constructed quantities: c. Prepare as-built drawings; and

d. Periodically verify the accuracy of the constructed works. 2. Survey shall be provided as required by the Owner's Representative as part of the QA/QC control.

3. In general, the constructed works shall be carried out within 50 mm vertically and 100 mm horizontally of the dimensions indicated on the Drawings. In the event that these tolerances are in conflict, the vertical tolerance shall prevail.

4. Where stricter grade control is required, at the discretion of the Owner's Representative, it shall be provided for.

NOTES GENERAL / GENERAL NOTES

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A 11-19-2012 FOR APPROVAL Y.B. R.M. A.H. REV. DATE DESCRIPTION REVISIONS

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