

# CEDAR RIVER PIT

## Aggregate Resource Assessment

### Technical Summary

#### Provincial Pit Number # 2049



Ministry of Transportation and Infrastructure  
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August 19, 2020

ML File: 2321-22462-00 Task 2002



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# 1 INTRODUCTION

McElhanney Ltd. is pleased to submit this technical summary report detailing the aggregate resource assessment conducted at Cedar River Pit for Ministry of Transportation and Infrastructure (MoTI). The purpose of the assessment was to conduct a test pit program in the existing mined pit and in areas of potential interest within the gravel reserve boundary to determine the potential aggregate resource volume, quality and suitability.

# 2 LOCATION AND LEGAL LAND DESCRIPTION

**Pit Name:** Cedar River Pit

**Provincial Pit Number:** #2049

**Location:** The portion of Cedar River Pit assessed was on the northern side of Highway 16 and west of the powerline right of way. Big Cedar River Forest Service Road is to the West of the Reserve Boundary. The location is approximately 48 km north of Highway 16 at east side of Nisga'a Highway, BC (Figure 1).

**Legal Land Description:** The legal description of the Map Reserve is Unsurveyed Crown Land in Range 5 Coast District. The power line along the east side of the assessment is located in the Right of Way Plan EPP59837. The layout of the Map Reserve boundary is shown in the Pit Plan (Figure 2).

# 3 FIELD ASSESSMENT

A test pitting program was conducted by McElhanney Ltd. on January 27, 2020, covering the Cedar River Pit on the west side of the Powerline Right of Way. A total of ten (10) test pits were excavated within the MoTI reserve boundary at the locations shown on Figure 2 to depths ranging from 2.0 m to 5.5 m below existing ground. A tracked 329e John Deere excavator was used to excavate the test pits. The test pits were logged and sampled by McElhanney Ltd. A Test Pit Summary Log is included in Appendix A. Soils were described according to the MoTI Unified Soil Classification (USC) Legend attached in Appendix A.

Samples of granular soils were taken during advancement of the test pits and a list of the samples collected were sent to MoTI for review and samples were selected for further laboratory testing based on discussions between MoTI and McElhanney Ltd. The following laboratory tests were performed:

- Wash Sieve Analysis (ASTM C136 and C117) on 10 samples;
- Sand Equivalent Value (ASTM D2419) on 3 samples;
- Micro Deval on Coarse Aggregates (ASTM D6928-03) on 3 samples;

- Relative Density and Absorption of Coarse and Fine Aggregate (ASTM C127 and C128) on 3 samples.
- Water-soluble chloride (ASTM C1218) and sulfate (CSA A23.2-2B and 3B) on 2 samples. Chloride and sulfate testing was completed by Caro Analytical Services, a third-party laboratory.

Laboratory results for the individual samples tested are summarized in the tables in the following sections and the appended Test Pit Summary Logs. Detailed laboratory reports can be provided upon request. Note that sieve analyses were conducted on material passing the 75 mm screen only. The percentage and size of oversize material was visually estimated in the field and are listed in the Test Pit Summary Log.

Test Pit locations and prominent features such as natural embankments, slope breaks, depressions and/or draws, roads and other manmade features were mapped using an iPad tethered to a high accuracy Trimble R1 GPS Receiver. The GPS data was differentially in real-time using the Satellite-Based Augmentation System (SBAS). A list of the processed test pit UTM coordinates, NAD 83 datum, is provided on the Pit Plan (Figure 2). Figure 2 also shows the test pit locations and prominent features. **Note the site was covered in 2 ft to 4ft of snow during the test pit assessment and many features typically mapped were obscured by the snow cover and drifts.**

Digital photographs were taken at each test pit location. Selected photographs are shown in the attached Photo Plate 1.

For the purpose of this project, granular material was defined as any soil with less than 15% fines (particles with a diameter < 0.075 mm) by mass. If granular material was encountered, the test pit was advanced to the full reach of the excavator unless significant sloughing prevented advancement of the test pit.

## 4 MATERIAL GRADATIONS

Based on the results of the test pit assessments, three areas (Areas A, B and C) have been defined within the existing MoTI reserve boundary and are shown on the Pit Development Plan (Figure 3). Other portions of the reserve where test pits were excavated but areas are not delineated on Figure 3 were not considered suitable for aggregate development.

Areas A, B and C were defined based on the location, depth of overburden including topsoil, gradations and oversize aggregate content.

Table 1 shows the gradation test results for Areas A, B and C as a percentage by mass of the fines, sand and gravel components. The MoTI soil classification for each of the laboratory tested samples from Areas A, B and C are also listed.

**Table 1. Laboratory Gradations for Areas A, B and C**

Test Pit	Depth (m)		Fines* (%)	Sand* (%)	Gravel (%)		MoTI Soil Classification
	From	To			Fine* (4.75-25mm)	Coarse* (25-75mm)	
<b>Area A</b>							
TP20-02 (Sa 3)	0.1	5.5	1.8	33.0	29.4	35.8	GP
TP20-04 (Sa 5)	0.5	4.5	2.0	45.5	28.9	23.6	GP
<b>Average of Area A</b>			<b>1.9</b>	<b>39.3</b>	<b>29.1</b>	<b>29.7</b>	-
<b>Area B</b>							
TP20-01 (Sa 2)	1.7	5.0	6.5	44.6	32.7	16.2	GP-GM
TP20-03 (Sa 4)	0.8	4.5	3.4	33.6	26.3	36.7	GP
TP20-06 (Sa 7)	-4.9	-1.2	4.5	26.6	28.8	40.1	GW
TP20-10 (Sa 13)	1.0	5.5	4.4	34.4	30.5	30.7	GP
<b>Average of Area B</b>			<b>4.7</b>	<b>34.8</b>	<b>29.6</b>	<b>30.9</b>	
<b>Area C</b>							
TP20-06 (Sa 9)	-0.3	4.5	2.2	43.8	36.0	18.0	GP
TP20-07 (Sa 10)	0.0	5.0	2.5	32.6	30.7	34.2	GP
TP20-08 (Sa 111)	0.1	5.5	2.8	35.7	28.4	33.1	GP
<b>Average of Area C</b>			<b>2.5</b>	<b>37.4</b>	<b>31.4</b>	<b>28.4</b>	

Notes: \* Values are rounded to the nearest decimal number so may not add exactly to 100%.  
 \*\* Minus depth indicates height above toe of pitface/embankment. 0.0 m elevation is toe of pitface.

A summary of the gradations corrected to include the estimated oversize is provided in Table 2.

**Table 2. Summary of Gradations Including Oversize Material for Areas A, B and C**

Test Pit	Fines* (%)	Sand* (%)	Gravel (%)		Small Boulders (75 to 300 mm)	Large Boulders (>300mm)	MoTI Soil Classification
			Fine* (4.75-25mm)	Coarse* (25-75mm)			
<b>Area A</b>							
TP20-02 (Sa 3)	1.1	20.8	18.5	22.6	35	2	GW
TP20-04 (Sa 5)	1.4	31.0	19.6	16.0	30	2	GP
<b>Average Area A</b>	<b>1.2</b>	<b>25.9</b>	<b>19.1</b>	<b>19.3</b>	<b>32.5</b>	<b>2</b>	<b>-</b>
<b>Area B</b>							
TP20-01 (Sa 2)	4.3	29.0	21.3	10.5	30	5	GP
TP20-03 (Sa 4)	2.3	22.9	17.9	25.0	30	2	GW
TP20-06 (Sa 7)	3.5	20.5	22.2	30.9	23	0	GW
TP20-10 (Sa 13)	3.1	24.1	21.3	21.5	28	2	GP
<b>Average Area B</b>	<b>3.3</b>	<b>24.2</b>	<b>20.7</b>	<b>22.0</b>	<b>27.8</b>	<b>2</b>	<b>-</b>
<b>Area C</b>							
TP20-06 (Sa 9)	1.9	38.1	31.3	15.6	12	1	GP
TP20-07 (Sa 10)	1.7	22.8	21.5	23.9	30	0	GW
TP20-08 (Sa 11)	1.8	22.8	18.2	21.2	35	1	GW
<b>Average Area C</b>	<b>1.8</b>	<b>27.9</b>	<b>23.7</b>	<b>20.3</b>	<b>25.7</b>	<b>0.6</b>	<b>-</b>

Notes: \* Values are rounded to the nearest decimal so may not add exactly to 100%.

## 5 MATERIAL DURABILITY

Table 3 shows the results of the durability tests as well as the specifications as required in the MoTI 2016 Standard Specifications for Highway Construction. Durability testing was only completed on select samples from Area A, B and C.

**Table 3. Durability Test Results for Areas A, B and C**

Test Pit	Durability Test			
	Micro-Deval (Coarse)	Sand Equivalent	Absorption (Coarse/Fine)	Bulk Relative Density (Coarse/Fine)
<b>Area A</b>				
TP20-02, Sa 3	13.1%	60.5	-	-
TP20-04, Sa 5	-	-	1.2% / 2.3%	2.66 / 2.62
<b>Area B</b>				
TP20-03, Sa 4	-	-	0.9% / 2.0%	2.66 / 2.64
TP20-10, Sa 13	13.3%	37.0	-	-
<b>Area C</b>				
TP20-07, Sa 10	14.9%	47.3	-	-
TP20-08, Sa 11	-	-	1.5% / 2.1%	2.64 / 2.63
<b>BC MoT Specifications<sup>1</sup></b>				
Micro Deval	≤30% for select granular subbase (coarse) and bridge end fill aggregates ≤25% for surfacing and base course aggregates ≤20% for Class 2 pavement asphalt mix aggregates ≤18% for Class 1 pavement asphalt mix aggregates			
Sand Equivalent	≥20 for subbase, bridge end fill and surfacing aggregates ≥40 for fine asphalt mix and base course aggregates			
Absorption	≤ 2% for coarse paving aggregates ≤ 1% for coarse aggregates in aggregate seal products ≤ 1.5% for fine aggregates in aggregate seal products			
Relative Density	~2.65 for all aggregate products			

The Micro-Deval of Areas A, B and C satisfy specifications for all the aggregates products listed in Table 3. The Sand Equivalent values did not meet the specification for base course and fine asphalt mix. The value of the Sand Equivalence in TP20-10, Sa 13 was 37.0 indicating a possible presence of plastic fines.

The coarse aggregate absorption test results for Areas A, B, and C met the specification for coarse paving aggregates. Only Area B met the specification for coarse aggregates in aggregate seal products; however, because the Sand Equivalent specification was not met in Area B, those aggregates may not be suitable for asphalt mixes. Additional testing is recommended in Area B to confirm suitability for asphalt products. None of the Areas met the specification for fine aggregates in aggregate seal products and are therefore not considered suitable for this use.

The specific gravity (relative bulk density) of the coarse aggregates was between 2.64 and 2.66 which is in the general vicinity of 2.65 that is preferred for all aggregate products.

<sup>1</sup> Ministry of Transportation, 2016 Standard Specifications for Highway Construction, Adopted July 1, 2016

It is mentioned that the aggregate resource contains a significant proportion of oversize material. Including this oversize material in the crushing process may improve the durability of the crushed products.

In general, if aggregates for asphalt mix and/or graded aggregate seal products are being considered for this pit, additional tests to determine overall averages in each of the areas is recommended.

Table 4 shows the sulphate and chloride content test results for select samples from Areas A and B. These results are provided for information only and were not interpreted or considered for material suitability at this time.

**Table 4. Sulphate and Chloride Content Test Results for Areas A and B**

Test Pit	Water-Soluble Sulphate	Water-Soluble Chloride
<b>Area A</b>		
TP20-02, Sa 3	<0.050%	<0.002%
<b>Area B</b>		
TP20-10, Sa 13	<0.050%	<0.002%

## 6 MATERIAL SUITABILITY

Based on the assessment results, the materials in Areas A, B and C are likely to be suitable for the following purposes (Table 5):

**Table 5. Material Suitability**

Area	Pit Run	Crush	Comments
Area A	Select granular subbase (SGSB), Bridge end fill (BEF)	Base Course Products Asphalt Paving Products	-Pit run (SGSB) and BEF requires screening of oversize - Fines content is too high in the area of TP20-10 and should be blended with cleaner materials
Area B	Select granular subbase (SGSB), Bridge end fill (BEF)	Base Course Products	-Pit run (SGSB) and BEF requires screening of oversize - Advise to complete additional absorption tests prior to producing asphalt mix aggregate and graded aggregate seal products.
Area C	Select granular subbase (SGSB), Bridge end fill (BEF)	Base Course and Asphalt Paving Products	-Pit run (SGSB) and BEF requires screening of oversize

All areas assessed in the reserve, with the exception of a pocket of material near TP20-10, were generally too clean (low fines content) to consider producing HFSA unless fines are blended in. As discussed previously, processing of oversize materials will improve durability results but will require screening for 75 mm minus pit run products during production.

## 7 VOLUME ESTIMATES

The volume estimates are provided in Table 6 and are based on the measured depths encountered during the test pit assessment. The potential volumes of granular material were calculated by averaging the total thickness of granular materials encountered over the Areas defined on Figure 3.

All test pits in Areas A, B and C were terminated in aggregates. The water table was encountered in TP20-05 at 1.5 m depth. TP20-05 appeared to be located in the lowest elevation area of the pit floor and this area was not included in any of the Areas for volume calculations of available aggregate. It is possible more aggregate may be available below the exploration depth of the test pits in Areas A, B and C; however, the depth to water table may not be far below the termination elevations of the test pits given that it was encountered in TP20-05. It should be noted that the water table could vary considerably seasonally and therefore considerably less volume of aggregate may be available if water table levels were to rise (for example, during spring freshet) – additional assessment would be required to monitor seasonal water table variation at this site.

Additional deep site assessment (drilling) would be required to confirm additional volumes in Areas A, B and C below the exploration depth of this assessment.

**Table 6. Volume Estimates**

Area	Surface Area (m <sup>2</sup> )	Thickness/ Volume	Topsoil	Overburden	Aggregate
Area A	12,900	Average Layer Thickness (m)	0.2	-	5.3
		<b>Volume (m<sup>3</sup>)</b>	<b>2,600</b>	-	<b>62,000</b>
Area B	16,200	Average Layer Thickness (m)	0.3	0.4	3.7
		<b>Volume (m<sup>3</sup>)</b>	<b>4,900</b>	<b>6,500</b>	<b>56,000</b>
Area C	12,400	Average Layer Thickness (m)	0.03	-	5.1
		<b>Volume (m<sup>3</sup>)</b>	<b>500</b>	-	<b>58,000</b>

Notes: Volumes rounded to nearest 100

## 8 PIT DEVELOPMENT NOTES

- All pit development must be carried out in accordance with the Health, Safety, and Reclamation Code for Mines in British Columbia, BC Ministry of Energy and Mines (2017, or later edition), the Standard Specifications for Highway Construction, BC Ministry of Transportation and Infrastructure (2016, or later edition) and the Aggregate Operators Best Management Practices Handbook for BC.
- The site is currently accessed from Big Cedar River FSR which branches off of Highway 113 (Nisga'a Highway) and is considered suitable for future development.
- The thickness of the topsoil varied in the different areas and will require stripping and placing in a designated stockpile areas. Mineral soil overburden was also encountered in some places (although not consistently), however, it must be stripped and stockpiled in designated stockpile areas. Topsoil should be stockpiled separately from overburden if otherwise present in descreet areas.
- All trees, vegetation and overburden are to be removed within 2 m of the top of the pit face. Logging, clearing and grubbing will be required for a majority of Areas A and B. Note that the trees on the site may not be large enough for merchantable timber (tree diameter up to 200 mm), and there appeared to be areas of new forest regeneration (trees approximately 3 to 5 m tall). Area C is primarily existing pit floor and has minor grubbing and stripping of overburden.
- Topsoil, overburden and aggregate cannot be removed within 5 m of the reserve boundary.
- Areas A and B can be mined from any existing pit faces towards the reserve boundaries. Processing can occur in the pit floor of Area C.
- Area C is the existing pit floor and is ideally mined last. Area C can be used for processing operations for Areas A and B, and stockpiling processed aggregates.
- The contractor must ensure that all materials passing through 375 mm x 450 mm slotted openings shall be used in the production of the crushed aggregates.
- No dumping of debris or petroleum products will be permitted and the site must be left in a clean and safe condition.
- At the completion of the pit development operations, but prior to the depletion of the pit, the sides of the pit faces, waste piles and overburden stockpiles must be trimmed to a 1.5H :1V slope. Active pit faces must be reshaped with native granular materials.
- Upon depletion of the pit, all disturbed areas must be reclaimed. The minimum reclamation procedure should include re-sloping of the pit-faces and waste piles to a 2H:1V slope, contouring the area for appropriate drainage, spreading of any overburden followed by topsoil and seeding.

## 9 LIMITATIONS OF REPORT

**Use of this Report.** This Report was prepared by McElhanney Ltd. ("McElhanney") for the particular site, design objective, development and purpose (the "Project") described in this Report and for the exclusive use of the client identified in this Report (the "Client"). The data, interpretations and recommendations pertain to the Project and are not applicable to any other

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**Standard of Care and Disclaimer of Warranties.** This study and Report have been prepared in accordance with generally accepted engineering and scientific judgments, principles and practices. McElhanney expressly disclaims any and all warranties in connection with this Report including, without limitation, any warranty that this Report and the associated site review work has uncovered all potential geotechnical liabilities associated with the subject property.

**Effect of Changes.** All evaluations and conclusions stated in this Report are based on facts, observations, site-specific details, legislation and regulations as they existed at the time of the site assessment. Some conditions are subject to change over time and the Client recognizes that the passage of time, natural occurrences, and direct or indirect human intervention at or near the site may substantially alter such evaluations and conclusions. Construction activities can significantly alter soil, rock and other geologic conditions on the site. McElhanney should be requested to re-evaluate the conclusions of this Report and to provide amendments as required prior to any reliance upon the information presented herein upon any of the following events: a) any changes (or possible changes) as to the site, purpose, or development plans upon which this Report was based, b) any changes to applicable laws subsequent to the issuance of the Report, c) new information is discovered in the future during site excavations, construction, building demolition or other activities, or d) additional subsurface assessments or testing conducted by others.

**Subsurface Risks.** Soil, rock and groundwater data were collected in general accordance with the standards and methods described in the Report. The classification and identification of soils, rocks and geologic formations was based on commonly accepted methods employed in the practice of geotechnical engineering and related disciplines. Interpretations of groundwater levels and flow direction are based on water level observations at selected test hole locations and are expected to fluctuate. Observations at test holes indicate the approximate subsurface conditions at those locations only. Subsurface conditions between test holes were based, by

necessity, on judgement and assumptions of what exists between the actual locations sampled, and may vary significantly from actual site conditions and all persons making use of this Report should be aware of, and accept, this risk. Even a comprehensive sampling and testing program, implemented in accordance with appropriate equipment by experienced personnel, may fail to detect all or certain conditions.

**Information from Client and Third Parties.** McElhanney has relied in good faith on information provided by the Client and third parties noted in this Report and has assumed such information to be accurate, complete, reliable, non-fringing, and fit for the intended purpose without independent verification. McElhanney accepts no responsibility for any deficiency, misstatements or inaccuracy contained in this Report as a result of omissions or errors in information provided by third parties or for omissions, misstatements or fraudulent acts of persons interviewed.

**Underground Utilities and Damages.** In the performance of the services, McElhanney has taken reasonable precautions to avoid damage or injury to subterranean structures or utilities. Subsurface sampling may result in unavoidable contamination of certain subsurface areas not known to be previously contaminated such as, but not limited to, a geologic formation, the groundwater or other hydrous body. McElhanney will adhere to an appropriate standard of care during the conduct of any subsurface sampling.

**Independent Judgments.** McElhanney will not be responsible for the independent conclusions, interpretations, interpolations and/or decisions of the Client, or others, who may come into possession of this Report, or any part thereof. This restriction of liability includes decisions made to purchase, finance or sell land or with respect to public offerings for the sale of securities.

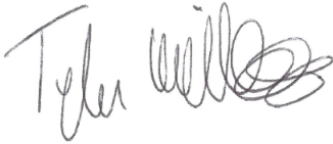
**Construction.** The subsurface information contained in this Report were obtained for the owner's information and design. The extent and detail of assessments necessary to determine all relevant conditions that may affect construction costs would normally be greater than the assessments carried out for this Report. Accordingly, a contingency fund to allow for the possibility of variations of subsurface conditions should be included in the construction budget to cover costs associated with modifications of the design and construction procedures resulting from conditions that vary from the assumptions in this Report. If during construction, subsurface conditions are found to be other than those described in this Report, McElhanney is to be notified and may alter or modify the geotechnical Report recommendations. If McElhanney is not retained to provide services during construction, then McElhanney is not responsible for confirming or recording that subsurface conditions do not materially differ from those interpreted conditions contained in this Report or for confirming or recording that construction activities have not adversely affected subsurface conditions or the recommendations contained in this Report.

## 10 CLOSURE

Please do not hesitate to contact the undersigned should you have any questions or comments.

Respectfully submitted,

**McElhanney Ltd.**



Tyler Wilkes, EIT Geotechnical  
Engineer

Reviewed By:

Emily Davidson, P.Eng., P.Geo  
Geotechnical Engineer

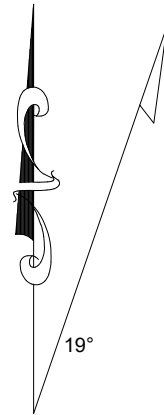
# DRAWINGS

Figure 1: Location Plan

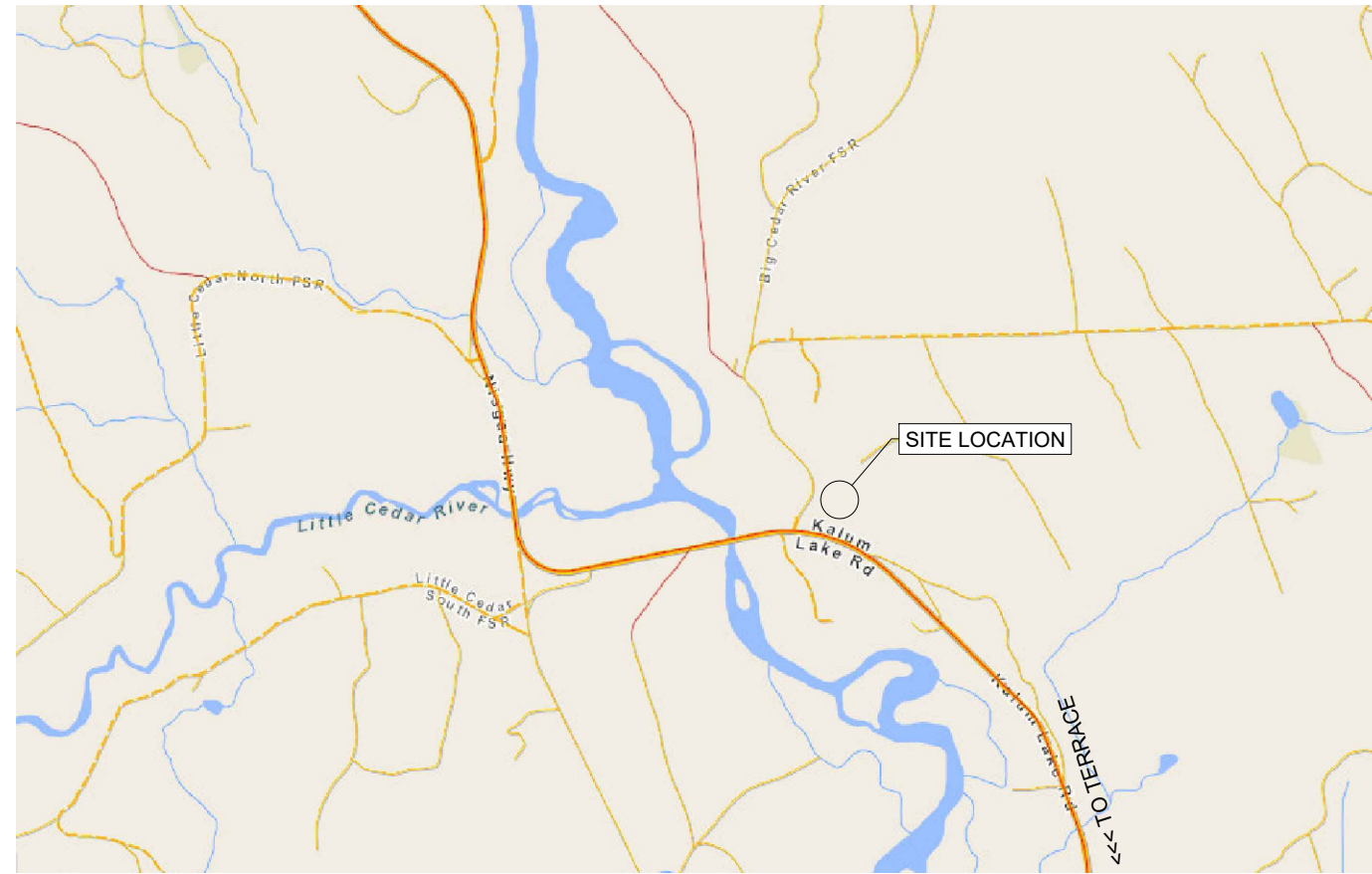
Figure 2: Pit Plan

Figure 3: Pit Development Plan

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 McElhanney ANSIB - 2020-01-01



**KEY PLAN**  
NOT TO SCALE



**LOCATION PLAN**  
NOT TO SCALE

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PA	2020-04-15	ISSUED FOR REPORT	RJH	TSW
Rev	Date	Description	Drawn	Design
			App'd	

ORIGINAL DWG SIZE: ANSI B (11" x 17")



Suite 1  
5008 Pohle Avenue  
Terrace BC  
Canada V8G 4S8  
T 250 635 7163

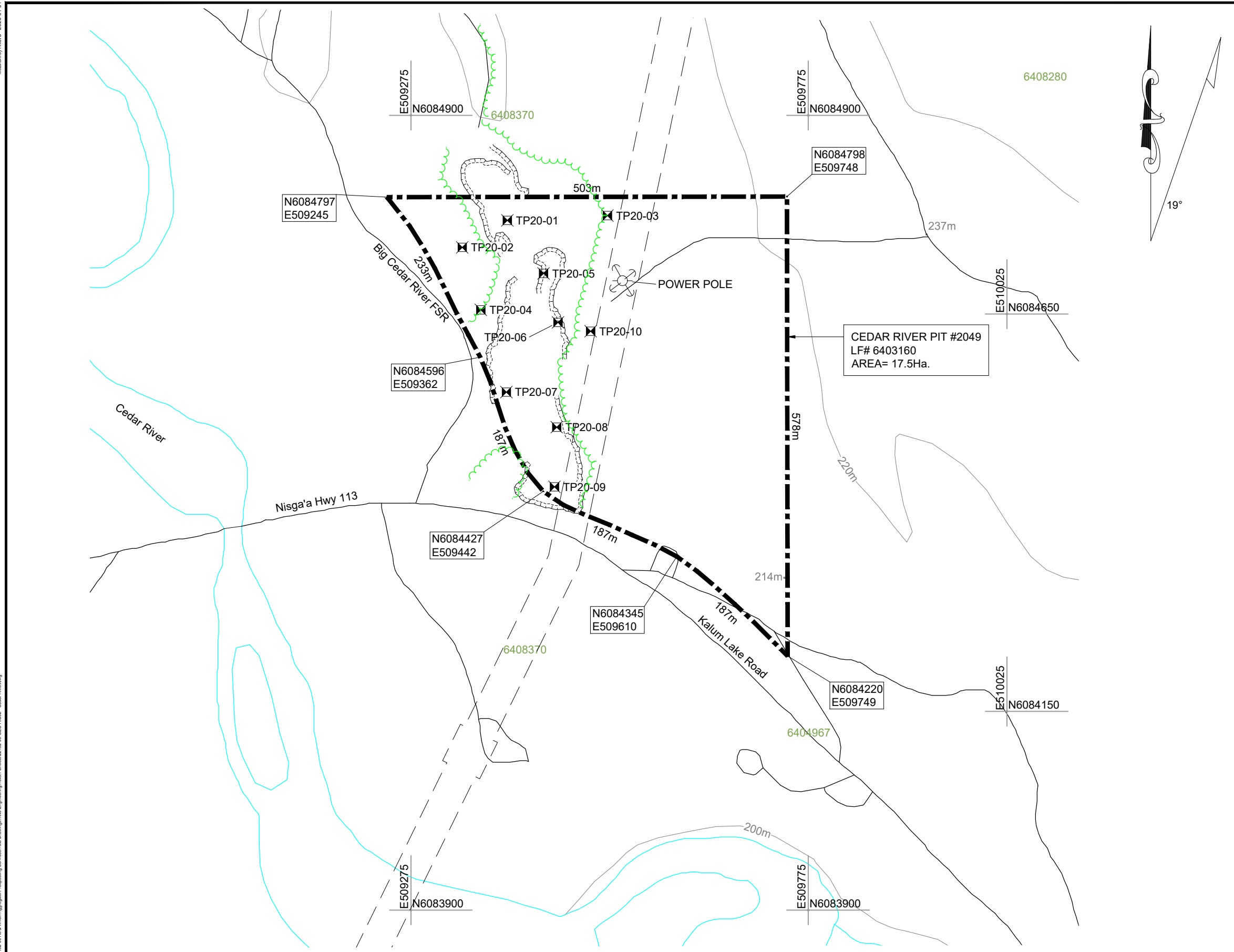
MINISTRY OF TRANSPORTATION &  
INFRASTRUCTURE - NORTHERN REGION

**SKEENA DISTRICT  
CEDAR RIVER PIT #2049  
LOCATION PLAN**

Drawing No.	
<b>FIG-01</b>	
Project Number	Rev.
2321-22462-00	PA

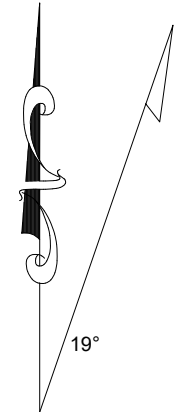
DESTROY ALL PRINTS BEARING PREVIOUS REVISION

DATE: 2020-09-14 08:41 FILE: Z:\2020\2020\2462-00-00-00\When Aggregate Projecting Services\10.3 Drawings\10.3 Sheets\2462-00-00-00-Cedar River.dwg



**PIT DEVELOPMENT LEGEND**

	NATURAL EMBANKMENT		TREELINE
	PIT FACE		CREEK
	TEST PIT		CONTOURS
	TEST HOLE		BUILDING (symbolic)
	PAVED ROAD		IRON PIN
	GRAVEL ROAD		SWAMP
	TRAIL		DEVELOPMENT DIRECTION
	DISTRICT LOT LINE		FUTURE AGGREGATE POTENTIAL
	GRAVEL RESERVE BOUNDARY		CRUSHER SETUP
	NO DISTURBANCE ZONE		
	OVERBURDEN STOCKPILE		
	STOCKPILE		



**TRIM NOTE:**  
 1. CONTOUR INTERVAL 20 METRES  
 2. BASE MAP DERIVED FROM TRIM MAP 1031.096.

**LEGAL NOTE:**  
 1. DISTRICT LOT LINES ARE DERIVED FROM DIGITAL CROWN CADASTRAL REFERENCE MAPPING SUPPLIED BY CROWN LAND REGISTRY, VICTORIA

**DATA NOTE:**  
 1. TEST PITS SURVEYED WITH TRIMBLE R1 EXTERNAL GPS PAIRED WITH AN IPAD ON JANUARY 27, 2020. COORDINATES PROCESSED IN REAL-TIME USING SATELLITE BASED AUGMENTATION SYSTEM (SBAS) DIFFERENTIAL CORRECTION. PRECISION IS A FUNCTION OF SATELLITE DISTRIBUTION AND DISTANCE TO THE POST PROCESSING BASE AT THE TIME OF MEASUREMENT.  
 2. PLAN FEATURES PARTLY SURVEYED WITH TRIMBLE R1 EXTERNAL GPS PAIRED WITH IPAD AND ALSO TAKEN FROM AVAILABLE DIGITAL PLANS OR APPROXIMATED BASED ON FIELD OBSERVATIONS.

TEST PIT LOCATIONS		
DESCRIPTION	NORTHING	EASTING
TP20-01	6084767.88	509396.30
TP20-02	6084733.84	509339.50
TP20-03	6084773.91	509522.30
TP20-04	6084655.25	509362.88
TP20-05	6084701.12	509441.84
TP20-06	6084639.46	509460.00
TP20-07	6084551.76	509395.04
TP20-08	6084507.59	509458.44
TP20-09	6084432.55	509455.61
TP20-10	6084628.37	509501.10

Rev	Date	Description	Drawn	Design	App'd
PA	2020-04-15	ISSUED FOR REPORT	RJH	TSW	

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0 1:5,000 250

ORIGINAL DWG SIZE: ANSI B (11" x 17")

Suite 1  
5008 Pohle Avenue  
Terrace BC  
Canada V8G 4S8  
T 250 635 7163

MINISTRY OF TRANSPORTATION & INFRASTRUCTURE - NORTHERN REGION

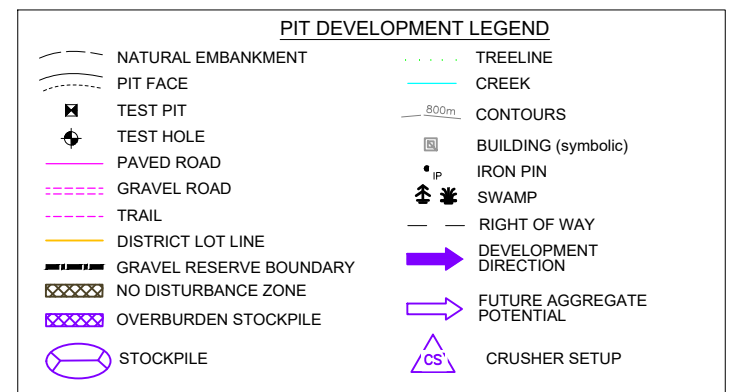
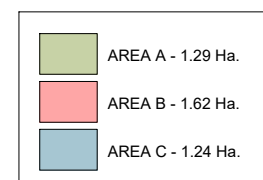
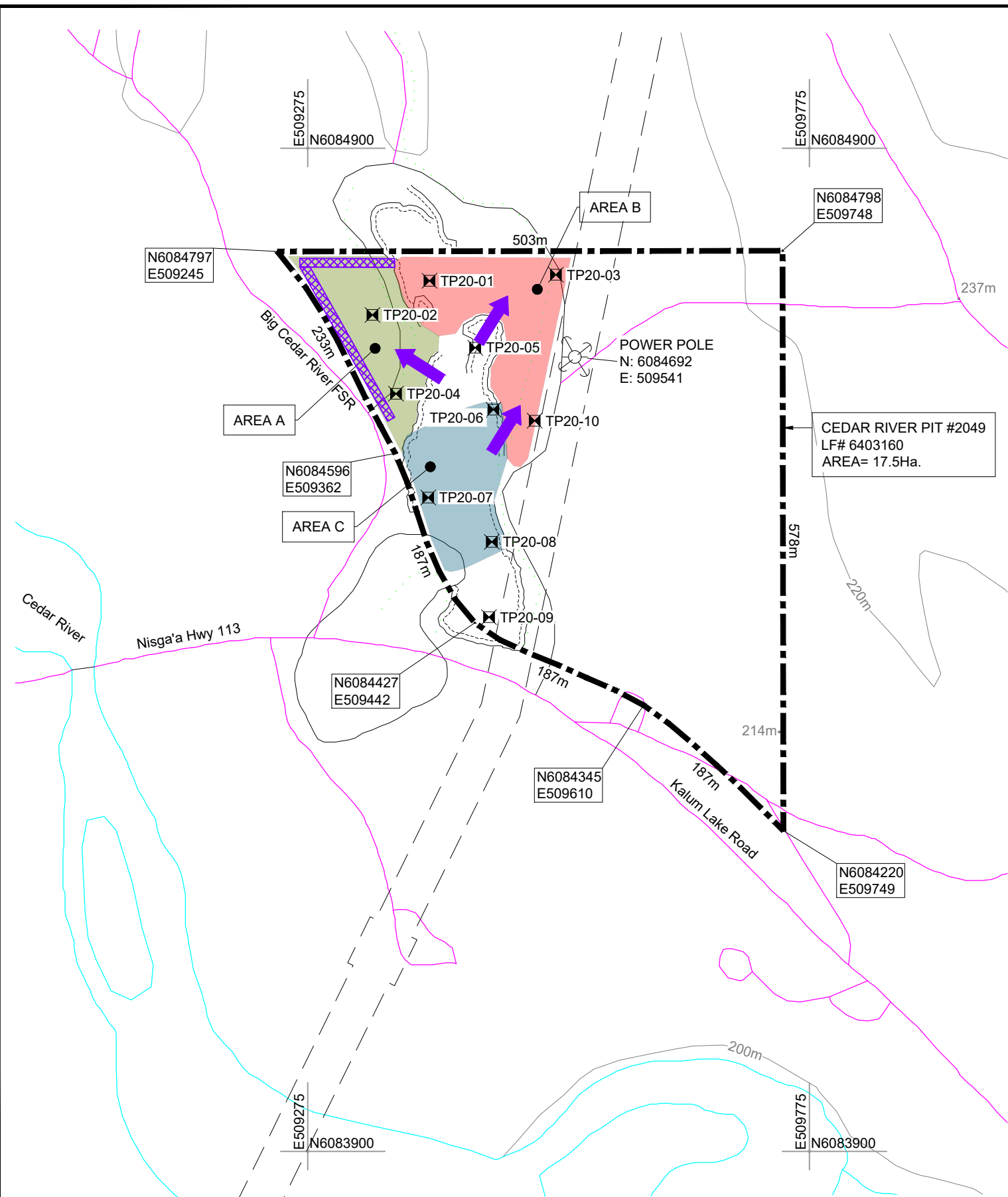
**SKEENA DISTRICT  
CEDAR RIVER PIT #2049  
PIT PLAN**

Drawing No. **FIG-02**

Project Number 2321-22462-00 Rev. PA

DESTROY ALL PRINTS BEARING PREVIOUS REVISION

DATE: 2020-04-15 10:30 FILE: \\2321\22462-00\A & W\Area Aggregate Projecting Services\10.0\Drawings\10.3\Shed\22462-00-CEC-FIG03 - Cedar River.dwg



**TRIM NOTE:**

1. CONTOUR INTERVAL 20 METRES
2. BASE MAP DERIVED FROM TRIM MAP 1031.096

**LEGAL NOTE:**

1. DISTRICT LOT LINES ARE DERIVED FROM DIGITAL CROWN CADASTRAL REFERENCE MAPPING SUPPLIED BY CROWN LAND REGISTRY, VICTORIA

**DATA NOTE:**

1. TEST PITS SURVEYED WITH TRIMBLE R1 EXTERNAL GPS PAIRED WITH AN IPAD ON JANUARY 27, 2020. COORDINATES PROCESSED IN REAL-TIME USING SATELLITE BASED AUGMENTATION SYSTEM (SBAS) DIFFERENTIAL CORRECTION. PRECISION IS A FUNCTION OF SATELLITE DISTRIBUTION AND DISTANCE TO THE POST PROCESSING BASE AT THE TIME OF MEASUREMENT.
2. PLAN FEATURES PARTLY SURVEYED WITH TRIMBLE R1 EXTERNAL GPS PAIRED WITH IPAD AND ALSO TAKEN FROM AVAILABLE DIGITAL PLANS OR APPROXIMATED BASED ON FIELD OBSERVATIONS.

**PIT DEVELOPMENT NOTES:**

1. ALL PIT DEVELOPMENT MUST BE CARRIED OUT IN ACCORDANCE WITH THE HEALTH, SAFETY, AND RECLAMATION CODE FOR MINES IN BC (2017, OR LATER EDITION), THE STANDARDS SPECIFICATIONS FOR HIGHWAY CONSTRUCTION, BC MINISTRY OF TRANSPORTATION AND INFRASTRUCTURE (2016, OR LATER EDITION) AND THE AGGREGATE OPERATORS BEST MANAGEMENT PRACTICES HANDBOOK FOR BC.
2. PIT DEVELOPMENT MUST NOT TAKE PLACE WITHIN 5 m FROM THE EDGE OF THE RESERVE BOUNDARY.
3. NO DUMPING OF DEBRIS OR PETROLEUM PRODUCTS WILL BE PERMITTED AND THE SITE MUST BE LEFT IN A CLEAN AND SAFE CONDITION.
4. THE AVERAGE THICKNESS OF THE TOPSOIL AND OVERBURDEN VARIED AND WILL REQUIRE STRIPPING AND PLACING IN THE DESIGNATED STOCKPILE AREAS. AREAS ARE DELINEATED ON THE PIT DEVELOPMENT PLAN. TOPSOIL SHOULD BE STOCK PILED SEPARATELY FROM MINERAL SOIL OVERBURDEN.
5. ALL TREES, VEGETATION AND OVERBURDEN ARE TO BE REMOVED WITHIN 2 m OF THE TOP OF THE PIT FACE. CLEARING AND GRUBBING WILL BE REQUIRED TO MINE PORTIONS OF AREAS A AND B. AREAS B AND AREA C HAVE BEEN PREVIOUSLY LOGGED AND AREA B HAS VARIOUS STAGES OF REGEN AND SLASH. AREA A MAY HAVE MERCHANTABLE TIMBER.
6. AREAS A AND B CAN BE MINED FROM ANY OF THE EXISTING PIT FACES TOWARDS THE RESERVE BOUNDARIES.
7. AREA C IS THE EXISTING PIT FLOOR AND IS IDEALLY MINED LAST. AREA C CAN BE USED FOR PROCESSING OPERATIONS FOR AREAS A AND B, AND STOCKPILING OF PROCESSED AGGREGATES.
8. THE CONTRACTOR MUST ENSURE THAT ALL MATERIALS PASSING THROUGH 375 mm X 450 mm SLOTTED OPENINGS SHALL BE USED IN THE PRODUCTION OF THE CRUSHED AGGREGATES.
9. WHEN THE CONTRACTOR DISCONTINUES OPERATIONS IN THE PIT, ALL WORKING FACES AND STOCKPILES MUST BE TRIMMED TO 1.5H:1V SLOPES. WORKING PIT FACES MUST BE SHAPED WITH NATIVE GRANULAR MATERIAL. ALL OTHER PERMANENT SLOPES MUST BE RE-SLOPED TO NO STEEPER THAN 2H:1V.

**TEST PIT LOCATIONS**

DESCRIPTION	NORTHING	EASTING
TP20-01	6084767.88	509396.30
TP20-02	6084733.84	509339.50
TP20-03	6084773.91	509522.30
TP20-04	6084655.25	509362.88
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TP20-07	6084551.76	509395.04
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TP20-09	6084432.55	509455.61
TP20-10	6084628.37	509501.10

Rev	Date	Description	Drawn	Design	App'd
PA	2020-04-15	ISSUED FOR REPORT	RJH	TSW	

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ORIGINAL DWG SIZE: ANSI B (11" x 17")



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MINISTRY OF TRANSPORTATION & INFRASTRUCTURE - NORTHERN REGION

SKEENA DISTRICT  
CEDAR RIVER PIT #2049  
PIT DEVELOPMENT PLAN

Drawing No.	FIG-03
Project Number	2321-22462-00
Rev.	PA

DESTROY ALL PRINTS BEARING PREVIOUS REVISION

# PHOTOGRAPHS

Photo Plate 1



Image 1. TP20-02 materials, Area A.



Image 2. Tree vegetation in Area A near TP20-02.



Image 3. TP20-01 materials, Area B.



Image 4. TP20-03 materials, Area B.



Image 5. TP20-10, Area B.



Image 6. TP20-10, Area B. Note tree cover.



Image 7. TP20-7, Area C.



Image 8. TP20-08, Area C. View to north of pit floor.

## APPENDIX A

Test Pit Summary Logs

MoT Unified Soils Classification Legend

Charts 1 to 8

**TEST PIT SUMMARY**

PROJECT #:		2321-22462-00 T2002												EXCAVATOR:		329E Cat Excavator										
DESCRIPTION:		Cedar River Pit												DATE:		January 27, 2020										
TEST PIT NUMBER	SAMPLE NUMBER	DEPTH (m)		LAYER THICKNESS (m)	FIELD VISUAL IDENTIFICATION										LABORATORY TEST RESULTS										Comments	
		From	To		Soil Classification	Fines < 0.075 mm (%)	Sand	Gravel <75 mm (%)	ADDITIONAL OVERSIZE				Water Table (m)	Sand Size (F,M,C)	Soil Classification	Fines < 0.075 mm (%)	Sand < 4.75 mm (%)	GRAVEL		Sand Equivalent	Micro-Deval % coarse/ % fines	Degrade	MgSO <sub>4</sub> %coarse / % fines	Bulk Relative Density % coarse / % fines		Absorption % coarse / % fines
									75 - 150 mm (%)	150-300 mm (%)	> 300 mm (%)	Max Size (mm)						< 25 mm (%)	25 - 75 mm (%)							
TP20-01	1	0.0	1.7	1.7	GW	4	46	50				50		C												Pit Floor. Crushed aggregate.
	2	1.7	5.0	3.3	GW-GM	8	30	62	20	10	5	400		C	GP-GM	6.5	44.6	32.7	16.2							
TP20-02		0.0	0.1	0.1	TS																					
	3	0.1	5.5	5.4	GW	3	37	60	25	10	2	400		C	GP	1.8	33.0	29.4	35.8	60.5	13.1					
TP20-03		0.0	0.1	0.1	TS																					
		0.1	0.8	0.7	ML	50	50							F												Reddish brown, rootlets
	4	0.8	4.5	3.7	GW	3	32	65	20	10	2	400		C	GP	3.4	33.6	26.3	36.7					2.66/2.64	0.9/2.0	
TP20-04		0.0	0.3	0.3	TS																					
	5	0.3	5.5	5.2	GW	3	35	62	25	5	2	400		C	GP	2.0	45.5	28.9	23.6					2.66/2.62	1.2/2.3	
TP20-05		-3.0*	-2.9	0.1	TS																					Rootlets
	6	-2.9	2.0	4.9	GW-GM	6	35	59	25	5		300	-1.5	C	GP	3.0	34.4	29.6	33.0							On pit face, but possibly previously disturbed or stockpiled material (soft digging).
TP20-06		-5.0	-4.9	0.1	TS																					Pit face.
	7	-4.9	-1.2	3.7	GW-GM	7	40	53	20	3		300		C	GW	4.5	26.6	28.8	40.1							
	8	-1.2	-0.3	0.9	SC4	40	60							F												
	9	-0.3	4.5	4.8	GW	3	37	60	10	2	1	500		C	GP	2.2	43.8	36.0	18.0							
TP20-07	10	0.0	5.0	5.0	GW	3	40	57	25	5		300		C	GP	2.5	32.6	30.7	34.2	47.3	14.9					Pit floor.
TP20-08		0.0	0.1	0.1	TS																					Pit Floor. Rootlets.
	11	0.1	5.5	5.4	GW	4	40	56	25	10	1	350		C	GP	2.8	35.7	28.4	33.1					2.64/2.63	1.5/2.1	
TP20-09		0.0	0.1	0.1	TS																					Pit Floor. Rootlets.
	12	0.1	0.5	0.4	GW	4	40	56	10			150		M-C												
		0.5	5.5	5.0	SP	3	62	35	5			100		M												



TEST PIT SUMMARY																										
PROJECT #:		2321-22462-00 T2002												EXCAVATOR:		329E Cat Excavator										
DESCRIPTION:		Cedar River Pit												DATE:		January 27, 2020										
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		From	To		Soil Classification	Fines < 0.075 mm (%)	Sand	Gravel <75 mm (%)	ADDITIONAL OVERSIZE				Water Table (m)	Sand Size (F,M,C)	Soil Classification	Fines < 0.075 mm (%)	Sand < 4.75 mm (%)	GRAVEL		Sand Equivalent	Micro-Deval % coarse/ % fines	Degrade	MgSO <sub>4</sub> %coarse / % fines	Bulk Relative Density % coarse / % fines		Absorption % coarse / % fines
									75 - 150 mm (%)	150-300 mm (%)	> 300 mm (%)	Max Size (mm)						< 25 mm (%)	25 - 75 mm (%)							
TP20-10		0.0	1.0	1.0	TS																				Reddish brown silt and sand with rootlets and organics	
	13	1.0	5.5	4.5	GW-GM	5	35	60	20	8	2	400		C	GP	4.4	34.4	30.5	30.7	37.0	13.3					

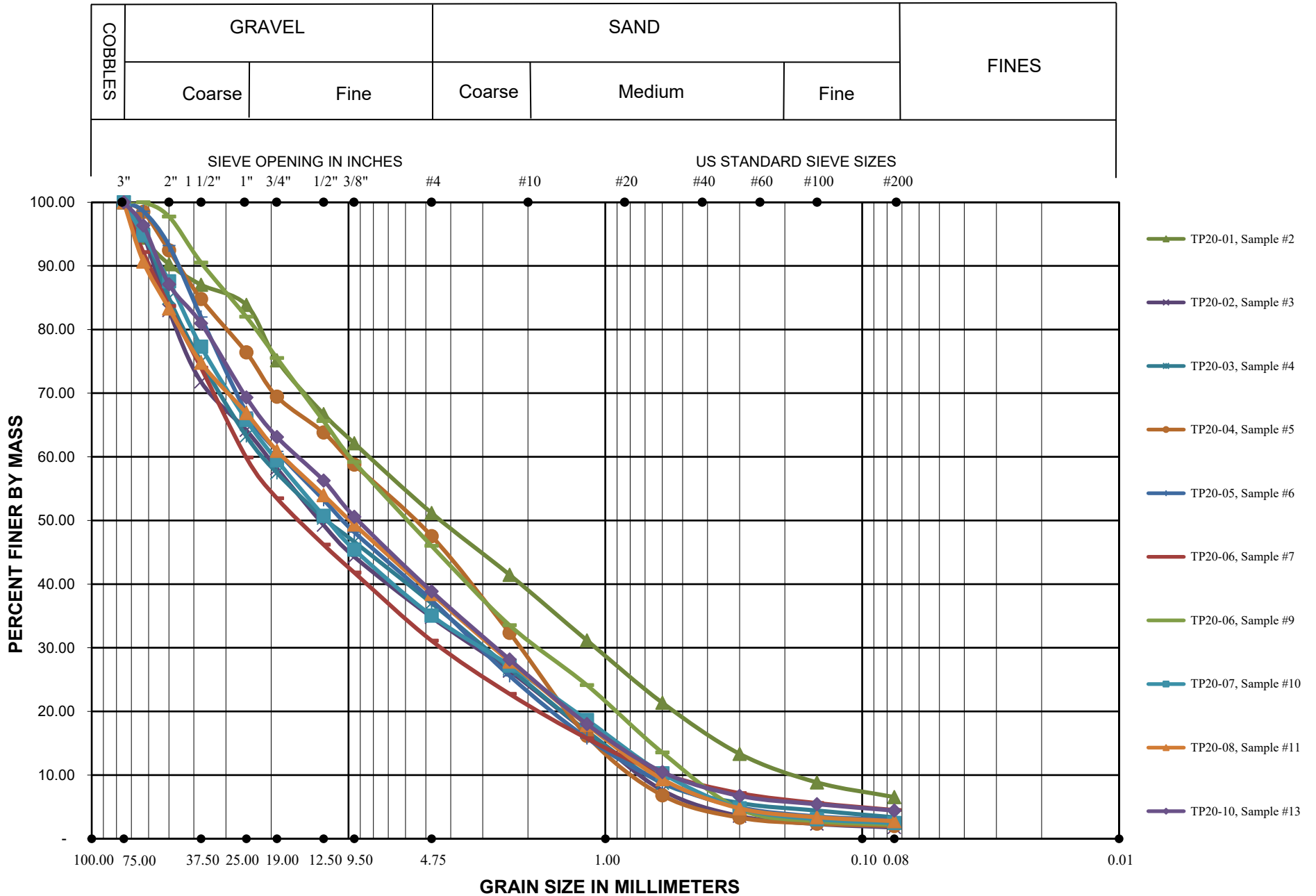
\*Note: Minus elevation is height above toe of pitface or embankment.



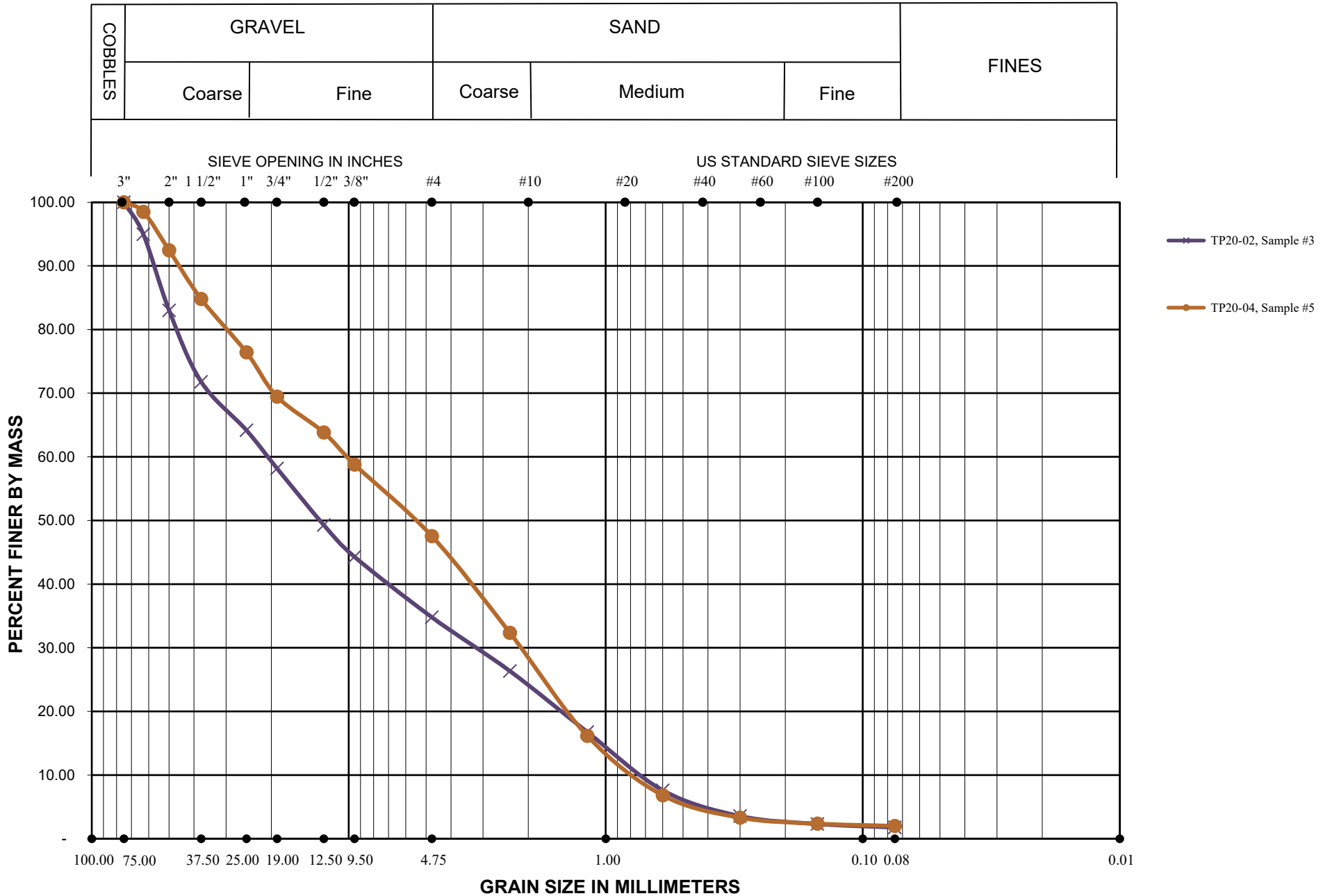
# MATERIALS CLASSIFICATION LEGEND

MAJOR DIVISIONS	SYMBOL	SOIL TYPE	
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	GW	WELL GRADED GRAVELS OR GRAVEL-SAND MIXTURES, < 5% FINES
		GP	POORLY-GRADED GRAVELS OR GRAVEL-SAND MIXTURES, < 5% FINES
		GM*	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
		GC*	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
	SAND AND SANDY SOILS	SW	WELL-GRADED SANDS OR GRAVELLY SANDS, < 5% FINES
		SP	POORLY-GRADED SANDS OR GRAVELLY SANDS, < 5% FINES
		SM*	SILTY SANDS SAND-SILT MIXTURES
		SC*	CLAYEY SANDS SAND-CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS $w_L < 50$	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
		CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
		OL	ORGANIC SILTS AND ORGANIC SILT-CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS $w_L > 50$	MH	INORGANIC SILTS, MICACEOUS OR DIATOM-ACEOUS FINE SANDY OR SILTY SOILS, PLASTIC SILTS
		CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
		OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
ORGANIC SOILS	Pt	PEAT AND OTHER HIGHLY ORGANIC SOILS	
TOPSOIL	TS	TOPSOIL WITH ROOTS, ETC.	
COBBLES	SB	ROCK FRAGMENTS AND COBBLES, PARTICLE SIZE 75mm TO 300mm	
LARGE BOULDERS	LB	BOULDERS, PARTICLE SIZE OVER 300mm	
BEDROCK	BR	BEDROCK	
FOR SOILS HAVING 5 - 12% PASSING .075 SIEVE, USE DUAL SYMBOL *GM1; GC1; SM1; SC1; 12 - 20% GM2; GC2; SM2; SC2; 20 - 30% GM3; GC3; SM3; SC3; 30 - 40% GM4; GC4; SM4; SC4; 40 - 50%		} PASSING .075mm SIEVE	

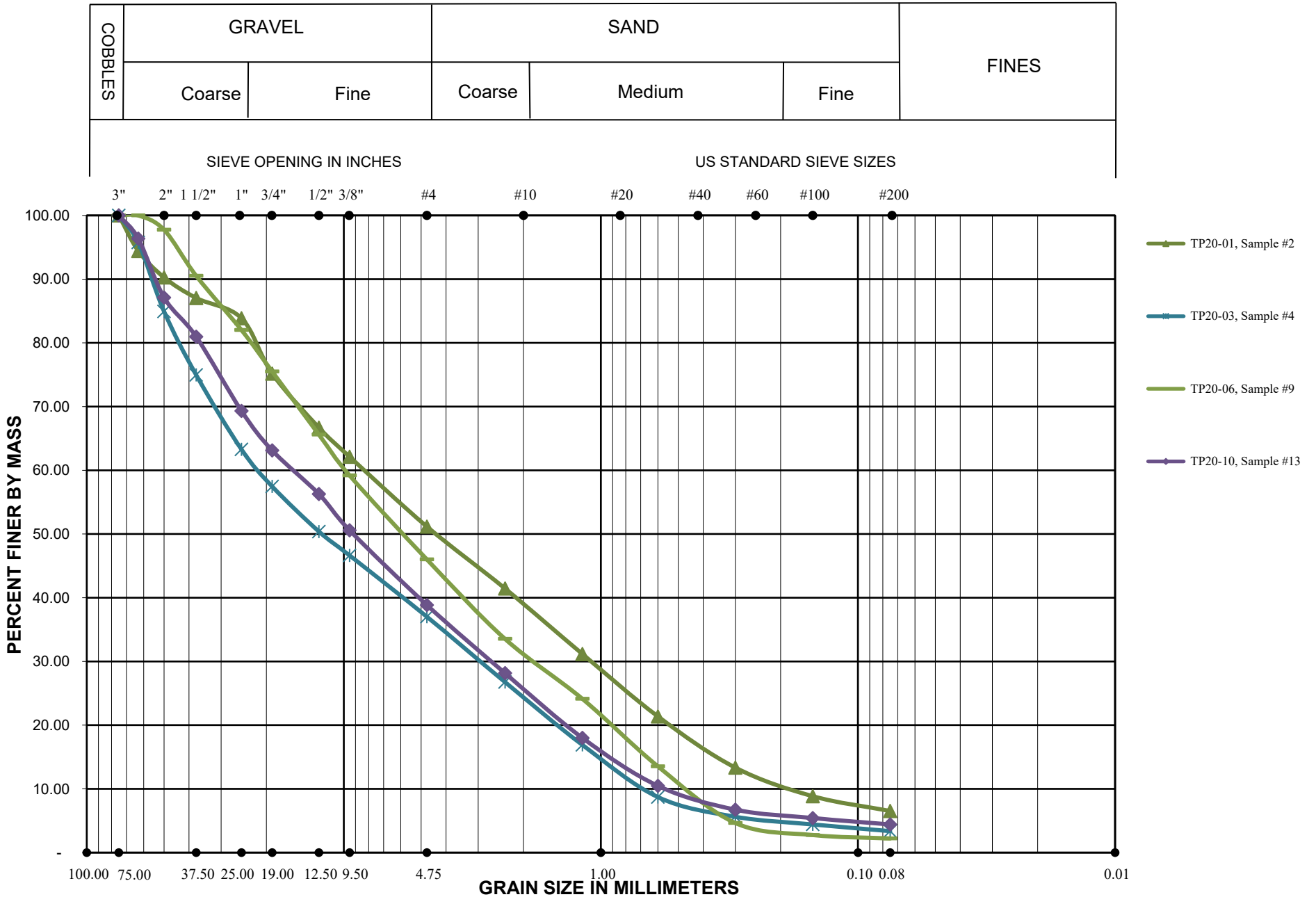
**CEDAR RIVER PIT**  
**CHART 1 - GRADATION CURVES - ALL SIEVES**  
**LABORATORY SIEVE REPORTS, OVERSIZE PORTION REMOVED (<75mm)**



**CEDAR RIVER PIT**  
**CHART 2 - GRADATION CURVES - AREA A**  
**LABORATORY SIEVE REPORTS, OVERSIZE PORTION REMOVED (<75mm)**

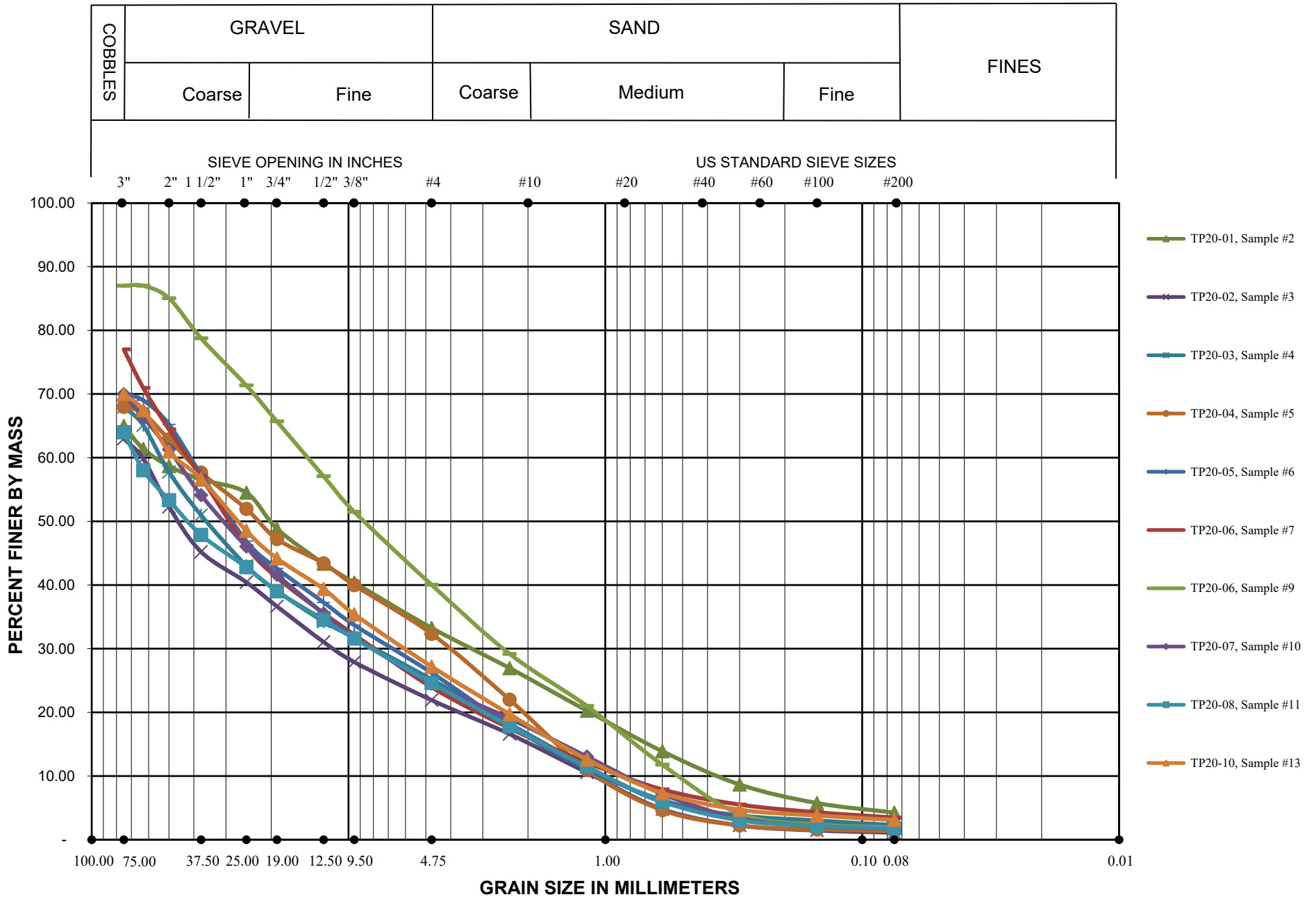


**CEDAR RIVER PIT**  
**CHART 3 - GRADATION CURVES - AREA B**  
**LABORATORY SIEVE REPORTS, OVERSIZE PORTION REMOVED (<75mm)**

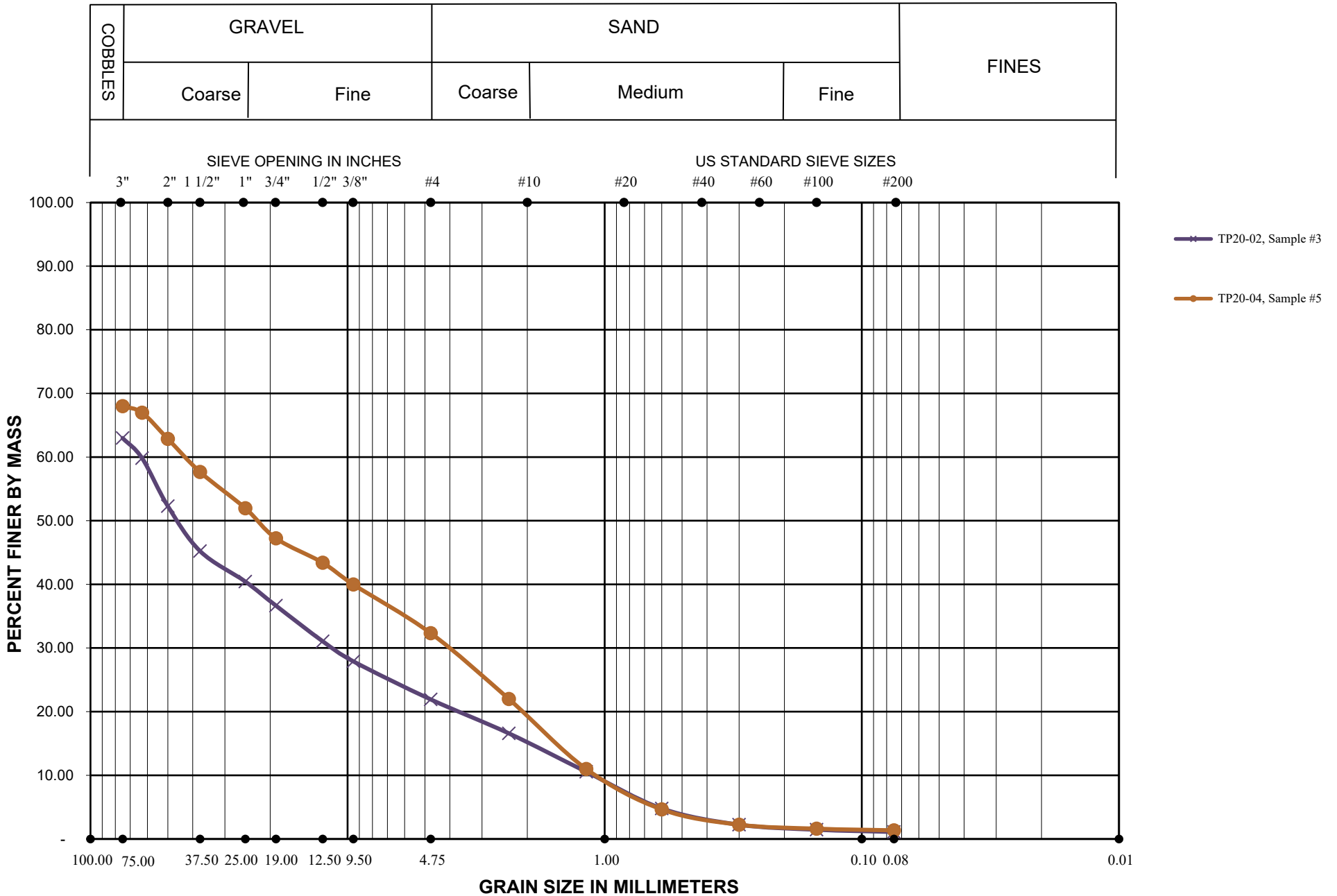




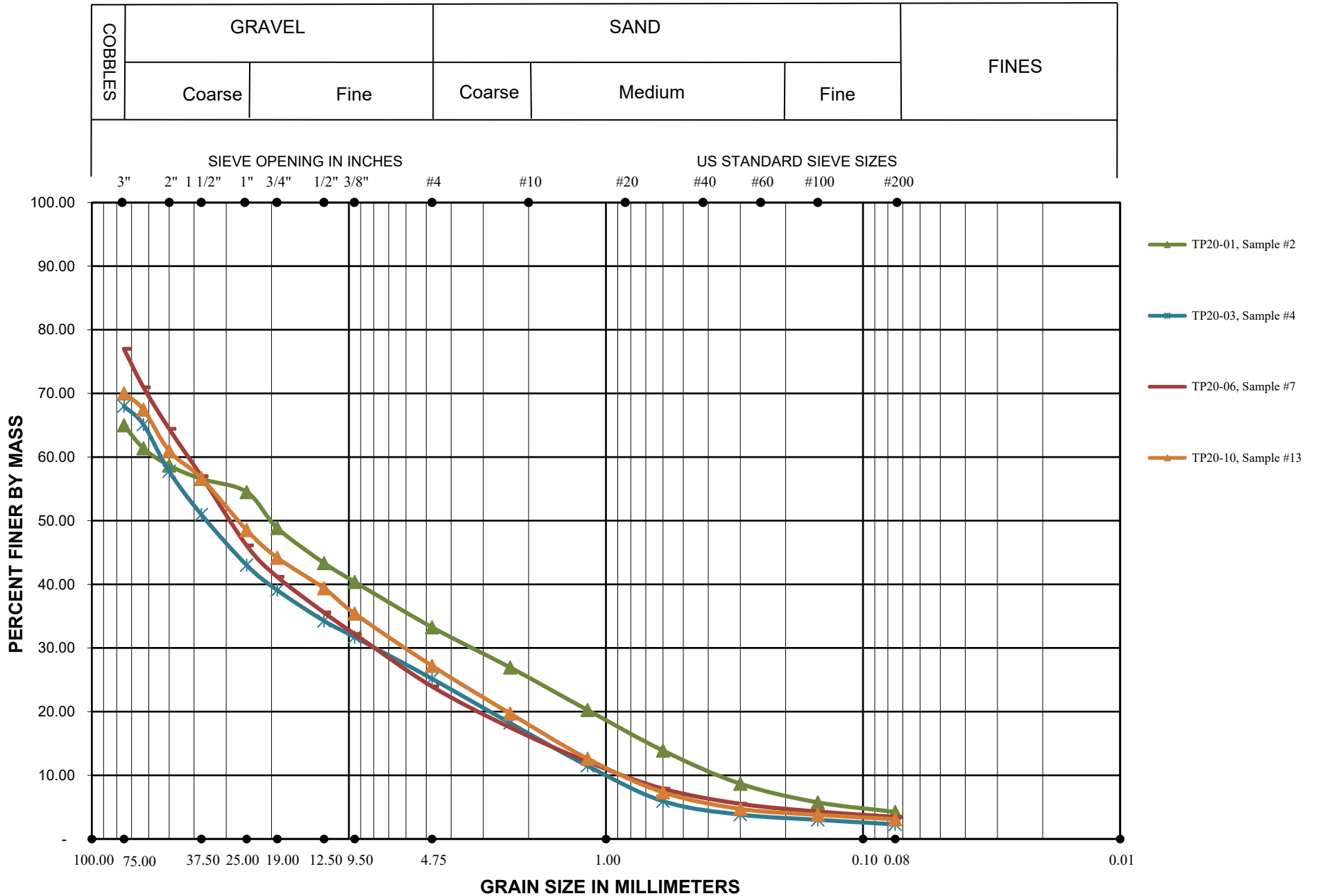
**CEDAR RIVER PIT**  
**CHART 5 - GRADATION CURVES - ALL SIEVES**  
**LABORATORY SIEVE REPORTS, OVERSIZE PORTION INCLUDED (>75mm)**



**CEDAR RIVER PIT**  
**CHART 6 - GRADATION CURVES - AREA A**  
**LABORATORY SIEVE REPORTS, OVERSIZE PORTION INCLUDED (>75mm)**



**CEDAR RIVER PIT**  
**CHART 7 - GRADATION CURVES - AREA B**  
**LABORATORY SIEVE REPORTS, OVERSIZE PORTION INCLUDED (>75mm)**



**CEDAR RIVER PIT**  
**CHART 8 - GRADATION CURVES - AREA C**  
**LABORATORY SIEVE REPORTS, OVERSIZE PORTION INCLUDED (>75mm)**

