COQUITLAM FIRE RESCUE

HELIPORT ASSESSMENT

TRAINING TOWER CONSTRUCTION
HELIPORT CLASSIFICATION & FLIGHT PATHS
NIGHT OPERATIONS & HELIPORT SIZE

Prepared for:
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Deputy Fire Chief Shawn Davidson – Operations Support

by RGHeliservices Consulting Inc.
2020-10-26

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HELIPORT OVERVIEW

Coquitlam Fire Rescue (CFR) heliport *("the heliport")* is owned and operated by the City of Coquitlam - Coquitlam Fire Rescue. It is a surface level heliport certified by Transport Canada for H3 classification day operations with night use permitted under night vision goggles (NVG). The heliport is primarily used for search and rescue, police and emergency operations. It is an important location although does not have high usage.

TRAINING TOWER REPLACEMENT PROJECT

In 2021, the existing fire-fighting training tower will be replaced with a new structure. Planning is ongoing with a site survey being completed by Underhill Geomatics and the tower design being managed by Chernoff Thompson Architects.

- The tower as designed will not interfere with the existing flight path.
- During construction the heliport will have difficulty remaining open and being safe to operate from.
- Although it is possible to remain open, it is recommended that the heliport be temporarily closed during the period of *significant construction*. That threshold will have to be analysed as the work plan progresses.

A Plan of Operations during Construction (POC) will have to be completed which is a document that will be shared with the building contractor, heliport operator and project team. It will be forwarded to Transport Canada and outlines the project, plans for the heliport during construction and communications protocols. Completion of the document will be prior to any construction activities commencing on the property.

Obstacle marking of the training tower and the installations of a windsock on the highest level would be required. Transport Canada Aeronautical Assessment Forms and NavCanada Land Use Forms are required to be submitted.

RECOMMENDATION #1: *Complete a Plan of Operations during Construction (POC)*

RECOMMENDATION #2: *Institute short term closure(s) for the heliport to align with periods of significant construction*

RECOMMENDATION #3: *Obstacle marking of new training tower*

RECOMMENDATION #4: *Submission of Transport Canada (Aeronautical Assessment Form) and NavCanada Land Use Form*

HELIPORT FLIGHT PATHS

In the interest of future proofing the heliport, the type of helicopter using the facility and the heliport regulations have to be considered. A primer on heliport classifications is included in Appendix C of this report.

HELIPORT CLASSIFICATION

The CFR heliport is an H3 classification which allows for single engine and multi engine helicopters to operate out of the heliport. CFR activates an intersection closure by way of red lighting overriding the normal traffic light sequence when a helicopter is on approach or departure. This procedure was approved by Transport Canada but requires strict adherence to pre-flight procedures. The location is in a congested area with emergency landing areas identified as the park and lake area to the southeast and the travelled portion of the road to the south that will be empty due to the intersection closure.

The H3 classification can be maintained unless further development encroaches within the flight path however the classification is not guaranteed. Should Transport Canada take a narrow interpretation of emergency landing areas and determine that there are insufficient to justify the H3 classification, a switch to H1 could occur. Planning should commence now to include two opposing H1 flight paths in addition to the H3 (refer to Appendix A drawings H-701 & H-702). This would improve safety of flight operations.

Pedestrian traffic adjacent the heliport on the 'river trail' should be controlled during current flight operations and with the future fight paths.

> **RECOMMENDATION #5:** *Design two opposing H1 flight paths to compliment the additional H3 flight path.*

> **RECOMMENDATION #6:** Institute pedestrian walkway closure during flight operations.

ABOVE GROUND FLAMMABLE FUEL TANKS

Transport Canada regulations do not allow above ground flammable fuel tanks to be within (under) the first 150m of the flight path, nor within 15m of the edge of the heliport Final Approach and Takeoff Area (FATO).

There is currently one above ground fuel tank 85m to the northeast and outside the flight path. A propane tank is planned to be located in the yard 80m to the northeast. Both these locations are acceptable for the current H3 flight path location and the recommended additional H1 flight paths.

> **RECOMMENDATION #7:** *Ensure the new propane tank is situated adjacent the above ground fuel tank and outside the proposed H1 flight path.*

HELIPORT SIZE

CRITICAL OR DESIGN HELICOPTER

A heliport declares the "critical" or "design" helicopter that the heliport specifications are based upon. At CFR the Airbus Astar (AS350) is the critical/design helicopter. Other helicopters can use the heliport and some may have better or worse performance but all must meet the size criteria of the AS350 which has an overall length of 42.7ft (13.01m).

SAR HELICOPTERS

Although the AS350 is a commonly used helicopter, it is still single engine with most multi-engine helicopters having a greater overall length. Talon Helicopters which conducts most SAR helicopter work in the lower mainland have three models of helicopters: AS350, the twin engine AS355 and the twin engine AS365. Although the AS355 can still fit in the current CFR heliport, the AS365 does not, being several feet longer at 45.1ft (13.73m). The AS365 is used for SAR and air ambulance operations.

The same applies to the RCMP Air Section in Langley. They operate the single engine EC120 which is slightly shorter than the AS350, also single engine and able to fly into the CFR heliport. The RCMP also operates a second helicopter, the Airbus H145 which is also longer than the AS350 at 44.76ft (13.64m). The H145 is a multi-engine helicopter and used for SAR, emergency, tactical and hoisting operations.

Neither the AS365 nor the H145 can presently fit into the heliport. It would be considered critical to make accommodations to allow both helicopters the ability to operate out of the CFR heliport.

FATO DIMENSIONS

The Final Approach and Takeoff area (FATO) is an area that is 1.5 times the overall length of the design or critical helicopter. At CFR the FATO size is 64ft (19.5m) in diameter. To accommodate the larger of the two helicopters, the AS365, a FATO with a diameter of 67.65ft (20.62m) is required. This size is not attainable at CFR due to sloping ground outside the current FATO.

REDUCED FATO SIZE EXEMPTION – NCR-032-2019

There currently is a Transport Canada exemption, which if the conditions are met will allow a FATO that is 1.4 times the overall length of the design or critical helicopter. For the AS365 the FATO size could be as small as 63.14ft (19.24m) which is slightly smaller than the CFR FATO. To justify the smaller sized FATO, the exemption requires that a safety area which surrounds the FATO is twice the overall length of the helicopter.

The Safety Area increased size is attainable at CFR however with an increased safety area the flight path width or what is called the *inner edge* is likewise increased. This increased inner edge has been calculated for CFR and it can be met without being impacted by the current or planned training tower facility.

To utilize the exemption, a Heliport Operations Manual (HOM) amendment must be submitted with verification that the exemption conditions have been met. A new flight path drawing would be submitted to Transport Canada for approval along with the amendment.

RECOMMENDATION #8: *Utilize the Reduced FATO Exemption – NCR-032-2019.*

NIGHT OPERATIONS & NIGHT VISION GOGGLES

The heliport was originally certified for day only operations. When night vision goggles (NVG) started to be utilized in Canada, Transport Canada allowed helicopters equipped with this technology to land at day only heliports if certain conditions were met.

The conditions were: notification to the municipal authorities and the emergency services that the heliport will be operating 24 hours; the location be assessed by the heliport operator and helicopter operator for obstacles that may pose a hazard to helicopters; and modification of the Canada Flight Supplement. These changes were captured under an informal level of service change.

In 2019 Transport Canada formalized the night operations at day only heliports by issuing a exemption that applied to Night Vision Imaging Systems (NVIS).

NVIS EXEMPTION – NCR-031-2019

The NVIS exemption (which includes the more common NVG operations) follows the requirements that were set out in the earlier informal Transport Canada procedure. The heliport operator has to include the NVIS exemption in the HOM and satisfy all conditions. Although CFR is not considered operating out of compliance, Transport Canada will require CFR to adopt the NVIS exemption to allow continued night operations at the heliport.

RECOMMENDATION #9: *Utilize the NVIS Exemption – NCR-031-2019.*

TOWER TRAINING CRANE

CFR is planning on erecting an abbreviated style of tower crane for training personnel in high angle rescue operations. The location proposed is in the northwest corner of the yard.

Although the height of the crane has not been determined, it will probably be in the range of 60ft above ground. The arm or jib of the crane may penetrate the recommended H1 flight paths. Although this is not ideal, the crane will likely be shielded by the trees on the adjacent property which are of a similar height and not cause additional performance constraints for helicopters operating on the H1 heliport flight path to the northeast.

RECOMMENDATION #10: *The location and configuration of the crane be considered to ensure that it does not affect helicopter operations.*

HELIPORT SURVEY – UNDERHILL GEOMATICS

A request was made to review the survey conducted by Underhill Geomatics in relation to flight path compliance and suitability for inclusion in the Heliport Operations Manual (HOM). During the review, Underhill Geomatics was contacted and the scope of their survey discussed. They understood their scope of work was to conduct a topo survey of the Coquitlam Fire Rescue property and assess any conflicts between the heliport, it's flight path and the proposed training tower. They had not conducted an aeronautical survey on a heliport prior to this project and were not aware of the technical specifications or physical characteristics of the heliport and the obstacle limitation surface (OLS).

Their conclusion, using a basic flight path overlay was correct in that the proposed training tower did not conflict with the existing flight path OLS. They did not assess any obstacles within the flight path (ie trees, other structures) for compliance with the OLS and did not survey outside the property.

To update the HOM drawings and verify that the current OLS is still compliant, an expanded survey would be required to survey all obstacles to a distance of 1075m from the safety area edge of the heliport. The survey would also serve the purpose of assessing the marking and lighting of all obstacles within 1000m of the FATO edge for the purposes of continued certification and for the NVIS exemption. The survey could also include what is called an H1 obstacle assessment, required every 5 years for an H1 classification heliport. Combining all three types of surveys would be cost effective.

RGHeliservices provided Underhill Geomatics with a CAD drawing depicting the heliport flight path OLS for the current and future configurations and left them with the request to verify compliance with the OLS for the area currently surveyed. Underhill has overlayed both flight path configurations on their survey for guidance to CFR (refer to Appendix A – Chernoff Project Drawing Package)

RECOMMENDATION #11: *Expand the area surveyed to include the flight path to 1075m from the safety area edge, the obstacle marking and lighting area to 1000m from the FATO edge and an H1 obstacle survey.*

RECOMMENDATION #12: *Resurvey the training tower upon completion.*

ADMINISTRATIVE

A review of the Heliport Operations Manual was not included in the scope of work. When the training tower construction is complete it would be timely to commission the updated survey and start the process to utilize the NVIS and Reduced FATO size exemptions. At

this point a significant HOM amendment or rewrite will be necessary. The NavCanada published Canada Flight Supplement (CFS) will require updating at the time of HOM amendment submission.

RECOMMENDATION 13: *Amend or rewrite the Heliport Operations Manual upon completion of the project.*

RECOMMENDATION 14: *Amend the Canada Flight Supplement.*

RECOMMENDATIONS

With careful planning the training tower, tower crane and propane tank will not impact the heliport except for the short duration of actual construction.

The heliport is in overall good condition and is a valuable resource for emergency services and search and rescue. With the upgrades in this report, the heliport should last for many years, be future-proofed and accessible to more helicopters and provide a safer operating environment for the helicopters, aircrew and persons on the ground.

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RECOMMENDATION #5: *Design two opposing H1 flight paths to compliment the additional H3 flight path.*

RECOMMENDATION #6: Institute pedestrian walkway closure during flight operations.

RECOMMENDATION #7: *Ensure the new propane tank is situated adjacent the above ground fuel tank and outside the proposed H1 flight path.*

RECOMMENDATION #8: *Utilize the Reduced FATO Exemption – NCR-032-2019.*

RECOMMENDATION #9: *Utilize the NVIS Exemption – NCR-031-2019.*

RECOMMENDATION #10: *The location and configuration of the crane be considered to ensure that it does not affect helicopter operations.*

RECOMMENDATION #11: *Expand the area surveyed to include the flight path to 1075m from the safety area edge, the obstacle marking and lighting area to 1000m from the FATO edge and an H1 obstacle survey.*

RECOMMENDATION #12: *Resurvey the training tower upon completion.*

RECOMMENDATION #13: *Amend or rewrite the Heliport Operations Manual upon completion of the project.*

RECOMMENDATION 14: *Amend the Canada Flight Supplement.*

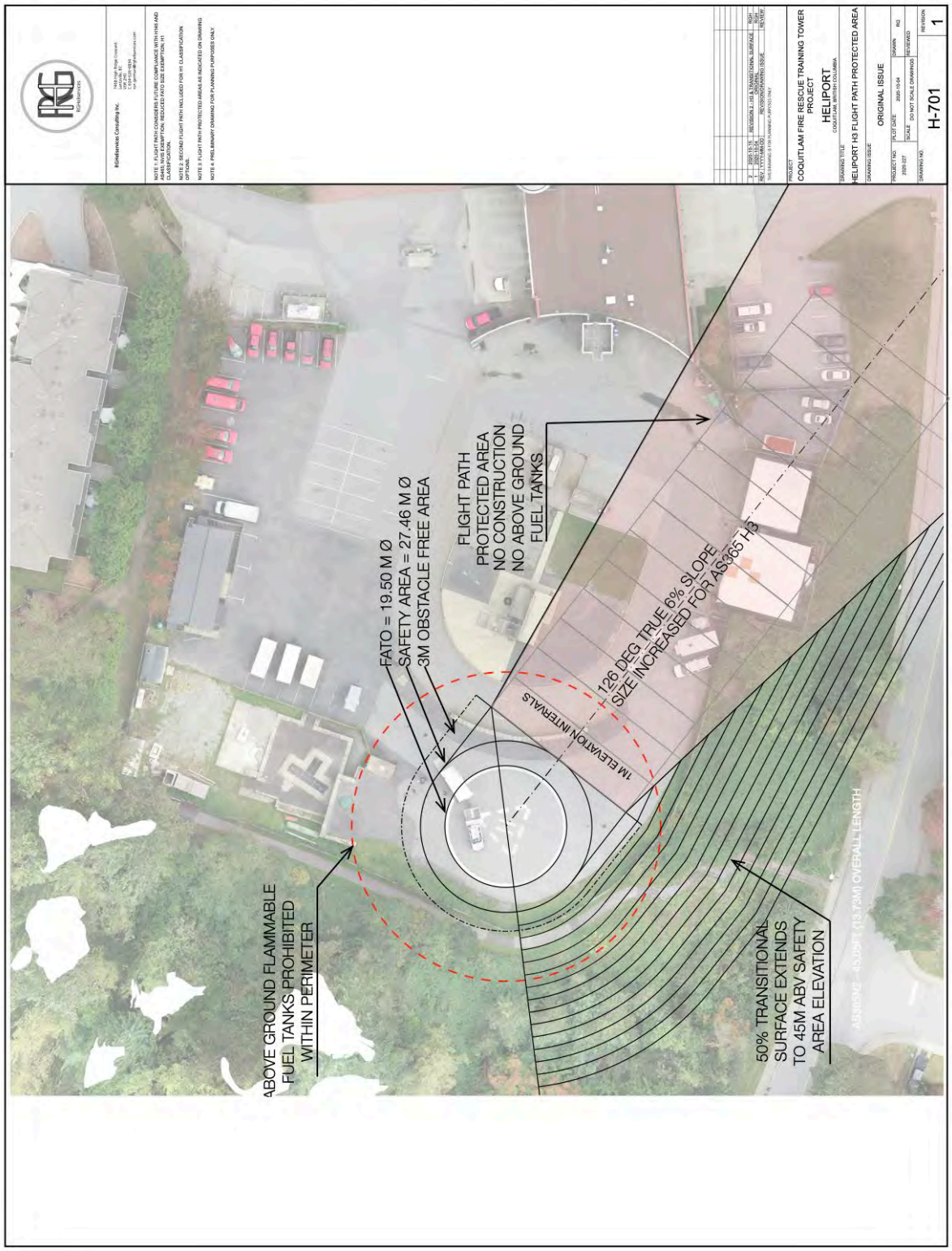
APPENDIX A - DRAWINGS

H-701 - H3 (current) Flight Path enlarged for the AS365

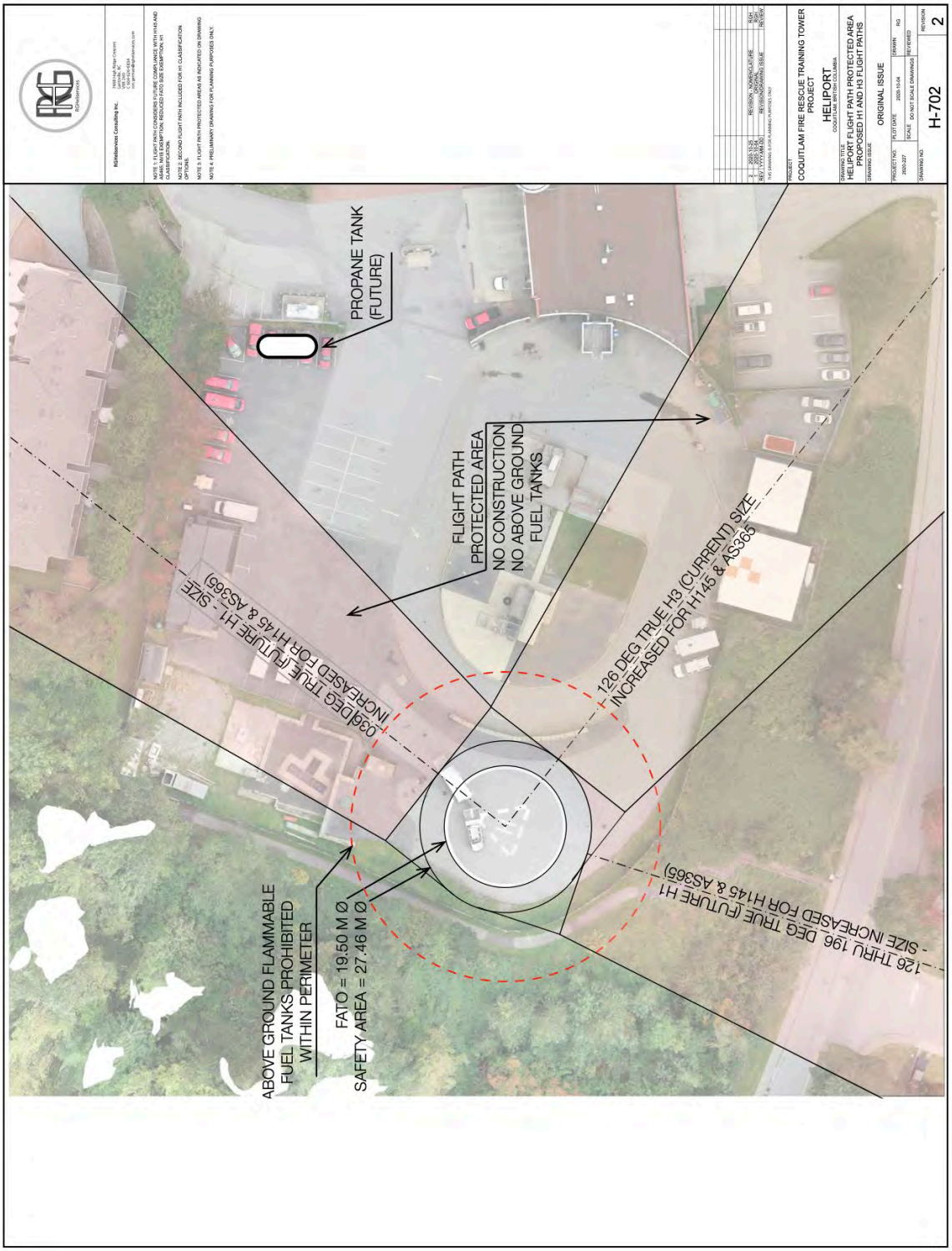
H-702 - H1 (future) and H3 (current) Flight Paths enlarged for the AS365

Chernoff Project Drawing Package 2020-10-13

H-701 H3 FLIGHT PATH



H-702 H1 & H3 FLIGHT PATHS



CHERNOFF PROJECT DRAWING PACKAGE

TOWN CENTRE FIREHALL TRAINING STRUCTURE REPLACEMENT

1300 PINETREE WAY, COQUITLAM, BC

CLIENT

CITY OF COQUITLAM
300 GUILDFORD WAY
COQUITLAM, BC
CONTACT: AIMAN ARAR, CAPITAL PROJECT MANAGER

CONSULTANT TEAM

ARCHITECTURAL — CHERNOFF THOMPSON ARCHITECTS
1340-1075 WEST GEORGIA STREET
VANCOUVER, BC V6E 3C9
CONTACT: TONY YIP, GLENN PETERS

CIVIL — H.Y. ENGINEERING LTD
200-3128 152
SURREY, BC V3R 4E7
CONTACT: DAVIS SHIM/ TREVOR NGO

STRUCTURAL — WICKE HERFST MAVER STRUCTURAL ENGINEERS
2227 DOUGLAS RD
BURNABY, BC V5C 5A9
CONTACT: FLORENCIO BAUTISTO

ELECTRICAL — AES ENGINEERING
950-505 BURRARD STREET
VANCOUVER, BC V7X 1M4
CONTACT: PAUL LUHMAN/ ABDUL HADDAD

SURVEYOR — UNDERHILL GEOMETRICS LTD.
8357 EASTLAKE Dr #301
BURNABY, BC V5A 4W2
CONTACT: PETER MURALT/ JONATHAN DYKE

DRAWING LIST

ARCHITECTURAL

A-01 COVER SHEET, PROJECT DATA, NOTES
A-02 SITE PLAN - DEMOLITION
A-03 SITE PLAN - NEW WORK
A-04 SITE PARTIAL PLAN
A-05 SITE SECTION
A-06 SITE PHOTOS
A-07 SPECIFICATIONS

CIVIL

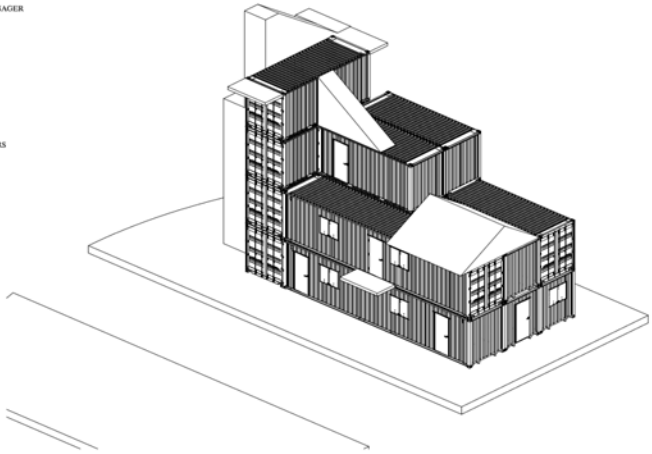
C-01 TO COME

STRUCTURAL

S-01 TO COME

ELECTRICAL

E-01 TO COME



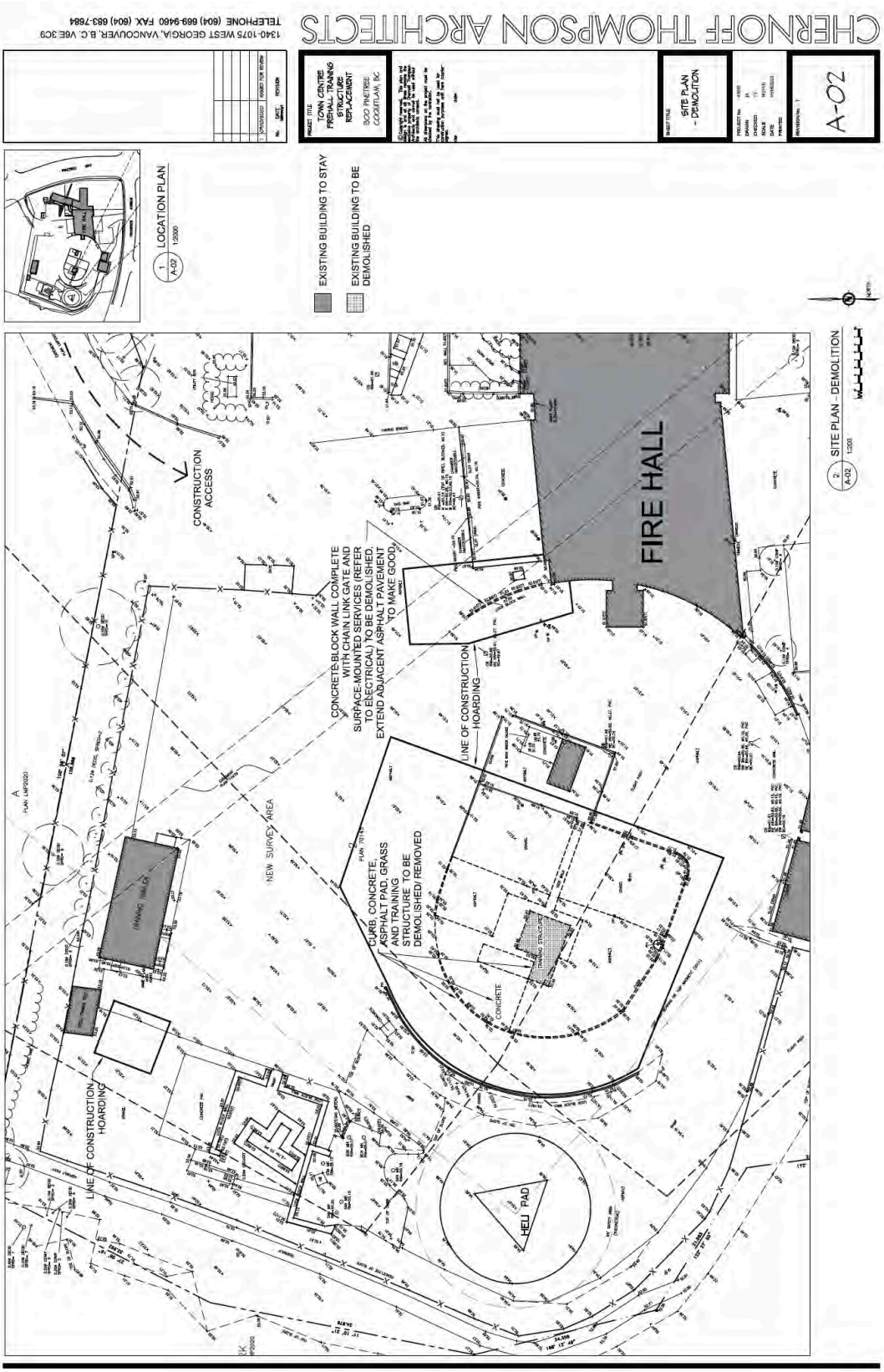
PROPOSED TRAINING STRUCTURE (N.I.C)

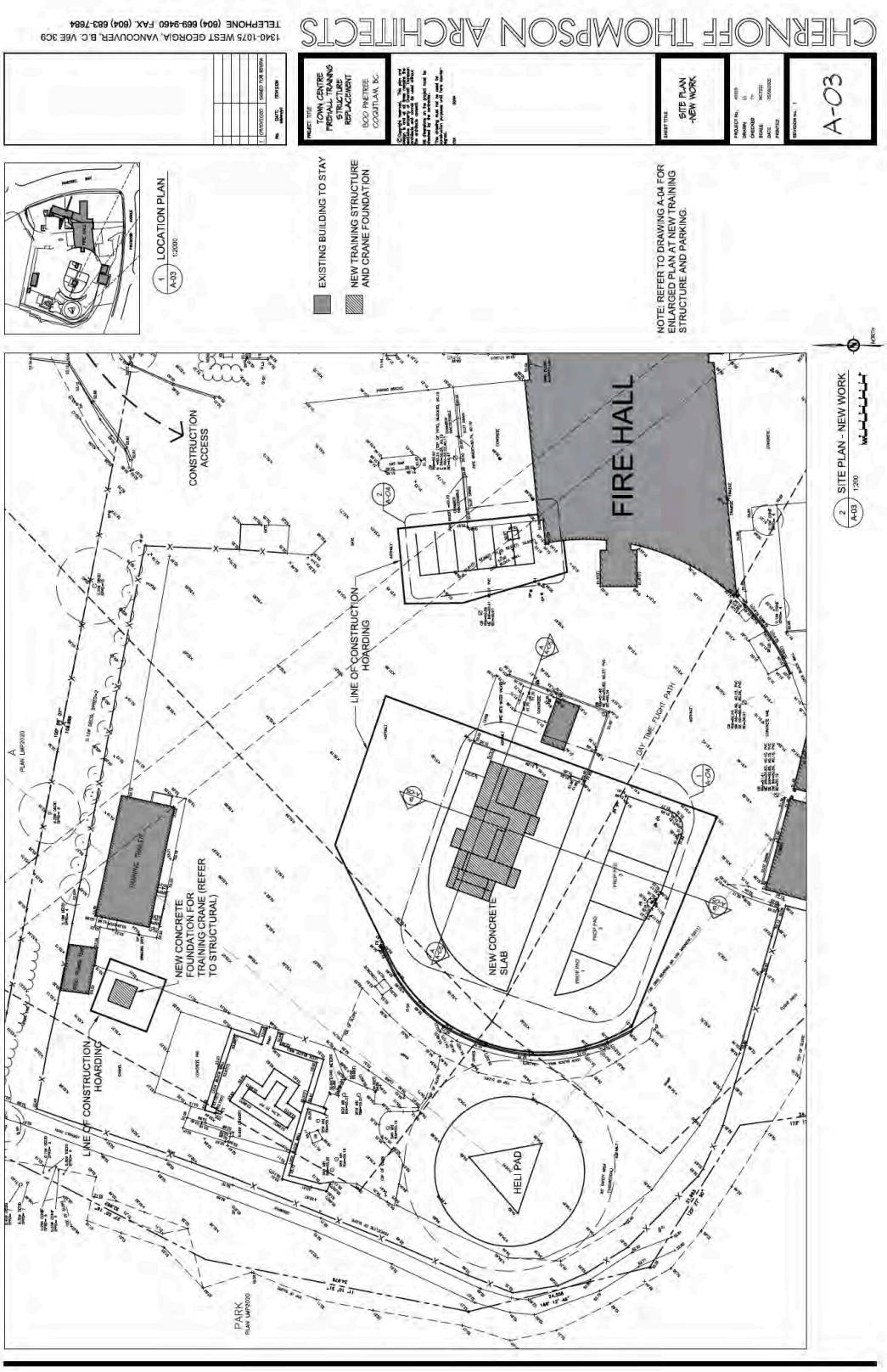
CHERNOFF THOMPSON ARCHITECTS
1340-1075 WEST GEORGIA VANCOUVER, B.C. V6E 3C9
TELEPHONE (604) 669-9460 FAX: (604) 683-7884

TOWN CENTRE FIREHALL TRAINING STRUCTURE REPLACEMENT
1300 PINETREE COQUITLAM, BC

COVER SHEET, PROJECT DATA, NOTES

A-01


CHERNOFF THOMPSON ARCHITECTS
1340-1075 WEST GEORGIA, VANCOUVER, B.C. V6E 3G9
TELEPHONE (604) 669-9460 FAX (604) 683-7684
TOWN CENTRE FIREHALL TRAINING STRUCTURE REPLACEMENT
3000 PINETREE COQUITLAM, BC
SITE PLAN - DEMOLITION
A-02
EXISTING BUILDING TO STAY
EXISTING BUILDING TO BE DEMOLISHED
1 LOCATION PLAN A-02 1:2000
2 SITE PLAN - DEMOLITION A-02 1:200
FIRE HALL
CONSTRUCTION ACCESS
CONCRETE BLOCK WALL COMPLETE WITH CHAIN LINK GATE AND SURFACE-MOUNTED SERVICES (REFER TO ELECTRICAL) TO BE DEMOLISHED. EXTEND ABJACENT ASPHALT PAVEMENT TO MAKE GOOD.
LINE OF CONSTRUCTION HOARDING
CURB, CONCRETE, ASPHALT PAD, GRASS AND TRAINING STRUCTURE TO BE DEMOLISHED/ REMOVED
NEW SURVEY AREA
HELI PAD
LINE OF CONSTRUCTION HOARDING


CHERNOFF THOMPSON ARCHITECTS
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PROJECT TITLE
CON CENTRE
FIRE HALL TRAINING
STRUCTURE
REPLACEMENT
3000 PINETREE
COQUITLAM, BC
SHEET TITLE
SITE PLAN
- NEW WORK
A-03
EXISTING BUILDING TO STAY
NEW TRAINING STRUCTURE AND CRANE FOUNDATION
NOTE: REFER TO DRAWING A-04 FOR ENLARGED PLAN AT NEW TRAINING STRUCTURE AND PARKING.
1 LOCATION PLAN A-03 1:2000
2 SITE PLAN - NEW WORK A-03 1:200
FIRE HALL
CONSTRUCTION ACCESS
LINE OF CONSTRUCTION HOARDING
NEW CONCRETE SLAB
NEW CONCRETE FOUNDATION FOR TRAINING CRANE (REFER TO STRUCTURAL)
TRAINING TOWER
HELI PAD
ON - TIME FLIGHT PATH
PARK
PLAN EPP2000

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TELEPHONE (604) 669-9460 FAX: (604) 683-7684
PROJECT TITLE
FIRE TRAINING CENTRE
FIRE HALL TRAINING STRUCTURE REPLACEMENT
3000 PINETREE
COQUITLAM, BC
SHEET TITLE
SITE PARTIAL PLAN
A-04
GENERAL NOTES:
1- TRENCH FOR SERVICES (ELECTRICAL CONDUIT) AND FILL WITH SUITABLE BACKFILL AND COMPACT.
2- REPAIR AND PATCH PAVEMENT TO EXISTING QUALITY OR BETTER.
3- CONTRACTOR TO PROVIDE MOCK LAYOUT OF ELECTRICAL INSTALL AND PARKING LINES PRIOR TO INSTALL FOR APPROVAL BY COQUITLAM FIRE RESCUE.
4- CONTRACTOR AND CFR TO DETERMINE IF REGARDING REQUIRED FOR DRAINAGE AFTER FENCING WALL REMOVAL
KEYNOTE:
1 PROVIDE ELECTRICAL OUTLET STAND:
1- 120 VOLT DUPLEX PLUGS MOUNTED 4' - 0" ABOVE FINISHED PAVEMENT.
2- CONDUIT AND ALL ELECTRICAL TO BE BELOW GRADE AND TO CODE.
3- TIE ELECTRICAL INTO BUILDING AND VERIFY CAPACITY OF EXISTING PANEL.
4- PROVIDE CONDUIT FOR EV CHARGE STATIONS (MAKE READY TO INSTALL ALL NECESSARY COMPONENTS FOR FUTURE USE).
5- STAND SHALL BE DURABLE AGAINST VEHICLE DAMAGE FOR PROVIDED WITH SUITABLE PROTECTION AND REFLECTIVE COLOR/ TREATMENT FOR VISIBILITY.
6- TYPICAL FOR 3 LOCATIONS AS SHOWN.
7- CONFIRM PRIOR TO CONSTRUCTION THAT CAPACITY EXISTS FOR ELECTRICAL REQUIREMENTS INCL. PANEL.
NEW TRAINING STRUCTURE BY OTHERS
TRENCH DRAIN (REFER TO CIVIL)
REINSTALL WINDSOCK ON MAST
NEW CONCRETE SLAB FLUSH WITH ASPHALT PAVEMENT AND SLOPED TO NEW CB LOCATIONS (REFER TO CIVIL)
PROP PAD 1
PROP PAD 2
PROP PAD 3
CB
EXISTING ASPHALT
1 SITE PARTIAL PLAN - NEW WORK
A-04 1:100 REF. DWG. A-01
PAINTED LINES FOR 6 NEW PARKING STALLS PARKING SHALL BE ALIGNED SQUARE TO THE GREEN LINE REFER TO ELECTRICAL FOR CHARGING INFRASTRUCTURE)
WHEEL STOP THIS SPACE ONLY
2 NEW STEEL BOLLARDS EAST OF HYDRANT PAINTED YELLOW TO MATCH EXISTING
VALVE COVER TO REMAIN UNAFFECTED
2 SITE PARTIAL PLAN - NEW WORK
A-04 1:100 REF. DWG. A-01

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PROJECT TITLE
TOWN CENTRE FIREHALL TRAINING STRUCTURE REPLACEMENT
1000 PINETREE COQUITLAM, BC
SHEET TITLE
SITE SECTION
A-05
1 LOCATION PLAN A-05 1:1000
FIRE HALL
PINEWOOD AVENUE
3 SITE SECTION A-A A-05 1:100
REINSTALL MAST AND WINDSOCK ON NEW TRAINING STRUCTURE C/W UPLIGHTS
REPLACEMENT TRAINING STRUCTURE BY OTHERS. COORDINATE NEW SERVICES TO STRUCTURE WITH TRAINING STRUCTURE CONTRACTOR
EXISTING ASPHALT
HELIPAD
52.30
52.15
52.10
51.40
2 SITE SECTION B-B A-05 1:100
REINSTALL MAST AND WINDSOCK ON NEW TRAINING STRUCTURE C/W UPLIGHTS
REPLACEMENT TRAINING STRUCTURE BY OTHERS
EXISTING ASPHALT
FINISH TRANSITION
CONTINUOUS TRENCH DRAIN WILL SURROUND THE NEW TRAINING STRUCTURE ON ALL FOUR SIDES
NEW CONCRETE
NEW CONCRETE SLAB SLOPED TO CB LOCATIONS
NEW CB
ASPHALT LANE
52.31

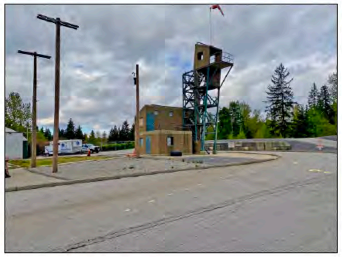

Photo 1

View of Training Structure to be demolished from the north-east. Building is load bearing masonry with a canted steel tower requiring phased demolition per structural to maintain stability during removal. Remove and safeguard existing windsock complete with support pole for reinstallation at top of new Training Structure.

Photo 2

View of Training Structure to be demolished from the west (helipad). Site demolition includes the removal of the concrete, asphalt, and grass surfaces within the perimeter concrete curb. The curb is to also be removed in its entirety as the new concrete training slab is to be flush with the asphalt driveway beyond (make good asphalt pavement up to edge of new slab.

Photo 3

View of Training Structure to be demolished from the south. Training hydrant is to be maintained and training power poles (three total) are to be reinstalled within the new concrete training slab.

Photo 4

View of Training Structure to be demolished from the south-east. Make good asphalt surface up to edge of new concrete training slab where concrete curb/grass has been removed. New training slab is to be sloped at minimum 1% to new catch basin locations (refer to civil). Spray enclosure at right side of photo is to remain unaffected.

Photo 5

View from east (looking west) at north-west corner of training site where concrete foundation for future training crane is to be constructed. Remain clear of asphalt pavement (repair if damaged by new work), and restore gravel surfacing flush with top of new foundation.

Photo 6

View of curved masonry wall near north-west corner of Town Centre Fire Hall to be demolished complete with all surface-mounted services. Install new asphalt pavement c/w compacted granular base across former wall location to make good site.

Photo 7

View of masonry wall and chain link gate to be demolished from the north-west. Provide two additional concrete filled steel bollards at east side of fire hydrant (to match existing) to provide protection from new parking stalls.

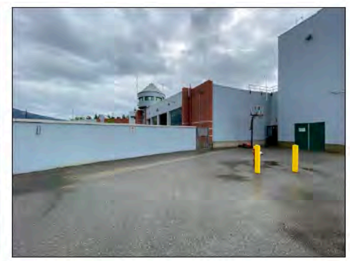

Photo 8

View of curved masonry wall and chain link gate to be demolished from the west with fire hydrant to have two additional protection bollards added to east side in the foreground. Provide new asphalt pavement at removed wall location and make good adjacent paving where affected by new work.

No.	DATE (dd/mm/yy)	REVISION
1	28/08/2020	ISSUED FOR REVIEW

PROJECT TITLE
TOWN CENTRE FIREHALL TRAINING STRUCTURE REPLACEMENT
1300 PINETREE COQUITLAM, BC

SHEET TITLE
SITE PHOTOS

PROJECT No. 40025
DRAWN IA
CHECKED TY
SCALE NOTED
DATE 05/06/2020
PRINTED

REVISION No. 1

A—06

CHERNOFF THOMPSON ARCHITECTS
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SPECIFICATIONS

GENERAL

A. This Specification is prepared in outline form and together with the Drawings, its intention is to describe a completely finished project of first class workmanship including all civil, structural, and electrical work. Specifications shall not be construed as excluding any items or materials otherwise indicated on the drawings, or considered reasonable components of a finished, sound and complete project.

B. Construction is occurring at a functioning Fire Station and Training Site and site access/hoarding must be established in a manner that does not impact the on-going operations by Coquitlam FireRescue (refer to drawings). Any revisions to the site access or hoarding must be approved in writing prior to adjustment.

C. Work is to only proceed on-site only once all items required for the described Work are delivered for immediate installation as required with no delay to minimize disruptions to the Training site.

D. The City will separately retain a company for the fabrication, delivery and installation of the new Training Structure and coordination with that company to ensure all related site installations are correctly located is the responsibility of this Contract.

E. Site Conditions:
Contractors must check and verify all site conditions. Notify the Managing Consultant in writing before proceeding with the work if discrepancies are evident between the drawings and the site conditions. No extra to the Contract will be allowed if discrepancies were evident prior to the start of the work.

F. Discrepancies:
The Contractor shall immediately notify the Managing Consultant of any discrepancies or ambiguities in the Contract Documents.

G. Insurance:
The General Contractor shall provide and pay for the Course of Construction Insurance. The insurance shall be in the joint names of the Owner, the Contractor, and the Consultants.

H. Permits:
The Owner shall obtain and pay for the Building Permit. The Contractor shall be responsible for and pay all other permits and connecting fees including electrical.

I. Code & Regulations:
All work shall be carried out in strict accordance with all Provincial and Municipal By-laws. The Contractor must know and understand all said regulations and will have on site a copy of the current edition of the British Columbia Building Code and local Building Bylaws, complete with all amendments.

J. Observe and enforce all construction safety measures required by WorkSafe BC and provide a current clearance letter with all applications for payment.

K. Protection of Work:
The Contractor shall protect his work from the elements and ongoing construction and shall replace or make good any damaged work resulting from his own neglect.

L. Protection of the Public:
The Contractor shall take all precautions to protect the public as required by law. All exiting, grounds, curbs, walks, etc. to be protected from damage. Contractor shall make good any damaged areas.

M. Workmanship:
All work shall be performed by skilled and experienced tradesmen and shall be of best quality only.

N. Temporary Facilities:
The Contractor shall provide and maintain in good condition temporary facilities and equipment required for the proper execution of the work, including a temporary site toilet and shall remove same from the site at completion of the contract. Such facilities shall meet all requirements of governing laws or regulations.

O. Cleaning:
The Contractor shall be responsible for and maintain all surfaces until date of substantial completion. Remove all debris from site daily, and provide a final cleaning prior to substantial completion.

P. Geotechnical Report:
The Contractor shall obtain a copy of the Geotechnical Report (from the Owner or Architect) and be familiar with the soil conditions on site. Promptly notify the Geotechnical Engineer if, upon excavation of test pits, the sub-surface conditions differ substantially from conditions indicated by the soils report information.

Q. As-Built Drawings (Cash Allowance):
The General Contractor and Sub-Trades are to maintain and safeguard a complete set of "Issued for Construction" drawings on-site which are to be clearly labelled "As-Built Drawings" with all revisions and concealed Installations clearly noted in red on the appropriate sheets as construction proceeds. These drawings are to be available for consultant review during construction and, prior to Substantial Completion, completed and provided to the consultants for the creation of digital "Record Drawings"

The General Contractor shall include a Cash Allowance of $5,000 (which does not include GST) to be paid direct to the Managing Consultant at Substantial Completion for the coordination of revision to (and delivery of) revised DWG and PDF "Record Drawings" to the City of Coquitlam.

R. Contractor Parking:
On-site parking is not available to construction personnel. Only vehicles directly related to the on-going construction activities are permitted to enter the Training Site from the north access road via prior arrangement with Coquitlam FireRescue.

SITE WORK

A. Selectively demolish/remove all concrete, asphalt, grass, and gravel surfaces as required to accommodate the new work, including trenching for underground service installations.

B. Grade uniformly to finished levels required to areas of concrete slabs on grade and asphalt pavement. Compact granular base to 98% standard Proctor Density (refer to Civil documents to sub-base requirements)

C. Neatly cut and remove asphalt pavement where required to trench and install new underground services (refer to Civil and Electrical). Provide compacted granular sub-base for reinstatement of all affected surfaces following completion of service installations.

D. Provide and Install new underground waterffoam catchment storage tanks complete with related installations and backfill as described by the Civil documents.

E. Remove all surplus soil and rubbish from site at completion of work, concrete slabs to adjacent asphalt and gravel surfaces, and infill asphalt pavement flush with adjacent.

CONCRETE

A. Refer to notes and specifications on the drawings for all structural concrete work and related reinforcing.

APPENDIX B – DEFINITIONS AND ABBREVIATIONS

"approach/departure path" means an area consisting of a quadrilateral area on the surface of the earth lying directly below the approach/take-off surface; it is also referred to as a flight path.

"BCEHS" means the British Columbia Emergency Health Services and refers to the Aviation Services department that manages the air ambulance program. BCEHS will be used exclusively in the HOM.

"BCAS" means the British Columbia Ambulance Service which operates under the authority of the BCEHS. It is also used to refer to the air ambulance program.

"classification" is assigned to a heliport and indicates the helicopter type and performance required to operate at the heliport:
"H3" refers to a heliport able to accommodate any helicopter type.
"H2" refers to a heliport able to accommodate any multi-engine helicopter.
"H1" refers to a heliport able to accommodate a multi-engine helicopter that will allow a safe landing or continue flight and clear all obstacles under the flight path by 4.5 m, with one engine inoperative.

"divergence" means the outer edge of the flight path beginning at the outside edge of the safety area and diverging out at a uniform rate of 10% for day use or 15% for night use and H1 classification.

"FATO" means a final approach and take-off area, which consists of a defined area over which the final phase of a helicopter approach manoeuvre to hover or land is completed and from which the take-off manoeuvre is commenced.

"heliport" means an aerodrome in respect of which a heliport certificate issued under Subpart 5 of CARs Part III is in force.

"heliport elevation" means the elevation of the highest point of each FATO.

"night" means the time between the end of evening civil twilight and the beginning of morning civil twilight.

"obstacle" means an object that could have an adverse effect on the safe operation of aircraft in flight or on the ground.

"OEI" means one engine inoperative in relation to a multi-engine helicopter.

"OLS" means an obstacle limitation surface that defines the limits to which objects may project into the airspace of an H2 and H3 classification heliport and consists of a take-off surface, an approach surface and a transitional surface or defines a line that links the maximum elevation points of all critical obstacles of an H1 classification heliport.

"overall length" means the maximum length of a helicopter, including rotors turning, measured through the fore and aft centre line of the helicopter.

"RFM" means rotorcraft flight manual.

"safety area" means a defined area surrounding the FATO which is kept free of obstacles other than objects required for navigation purposes.

"The Minister" means the Minister of Transport. The powers assigned to the Minister are delegated to different levels of Transport Canada technical and civil aviation safety inspectors and other employees.

"TLOF" means a touchdown and lift off area, which consists of a load-bearing area on which a helicopter may touch down or lift off.

"Transport Canada" is the federal government regulator that has authority over heliports and may also be referred to as *'TC'* in the HOM

APPENDIX C - HELIPORT STANDARDS AND CLASSIFICATION

GENERAL

A basic primer in heliport standards is necessary to understand the context of this report and the findings. There are three heliport classifications: H1, H2 and H3.

H2 AND H3 CLASSIFICATIONS

H2 and H3 require emergency landing areas within 625m of the heliport and have a defined initial flight path slope that ranges between 6% and 10% for the first 245m and a second section with a 16% slope for 830m. The emergency landing areas are unoccupied spaces that a helicopter can crash land into without risking the lives of persons on the ground or damaging structures. Basic math can also determine how high an obstacle (or building) can be for an H2 and H3 heliport.

Helicopters that can operate from H2 heliports are multi-engine only while those that operate from H3 heliports can be either single or multi-engine.

H1 CLASSIFICATION PERFORMANCE REQUIREMENTS

Unlike H2 and H3 heliports, an H1 classification has no flight path slope maximum percentage, therefore simple calculations cannot be made to determine maximum obstacle height. H1 classification instead has a "performance requirement" that the helicopters have to meet. Regulations specify what is required:

- the helicopter must be multi-engined;
- the Category "A" rotorcraft flight manual (RFM) supplement which deals with one engine inoperative (OEI) procedures must be followed;
- calculations and flight profiles must ensure that should an engine fail on approach or take-off (OEI), the helicopter can either land safely or continue flight and clear all obstacles in its flight path by 15 feet (4.5m).

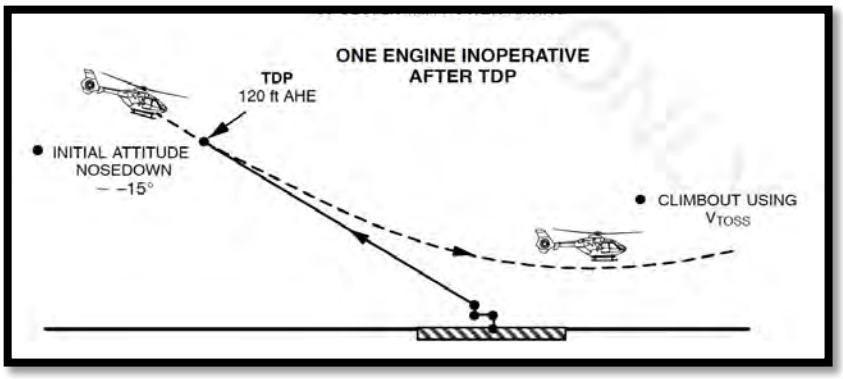
Helicopter weight, heliport elevation, ambient temperature, day/night operations and height of obstacles within the flight path are considered in helicopter performance calculations. All these parameters affect the helicopter's ability to meet the H1 classification.

The way to determine whether a helicopter can meet the H1 performance requirement is to calculate the obstacle heights and distances in relation to the heliport elevation and factor in ambient temperature, helicopter weight, wind direction and wind strength. These calculations are complicated and the methods to calculate differ from one helicopter manufacturer to another. Some helicopters have different performance charts for ground level heliports vs elevated or rooftop heliports and differences in day and night operations. Approaches and departures also have different parameters to consider.

Higher heliport elevations and hotter temperatures translate into degraded engine performance and less ability to clear higher obstacles. Pilots generally refer to pre calculated charts during approaches and departures to determine compliance with H1.

The H1 standards do not require a helicopter to be able to clear all obstacles within the designated flight path, but only those obstacles in the specific approach or departure route chosen by the pilot. Therefore, if a tall tree is in the centre of a flight path, the pilot does not have to clear that tree if the route chosen avoids it altogether and the pilot is able to clear the remaining obstacles on the chosen route.

The following graphic shows the standard departure profile for the EC135T2 helicopter and the profile for recovery and continuing flight when an engine fails on departure.



Category "A" supplements often require a vertical and rearward climb prior to transitioning to forward flight. The rearward portion of the procedure has specific obstacle clearance restrictions which have to be considered. The graphic below shows the rearward clearance required for the EC135T2.

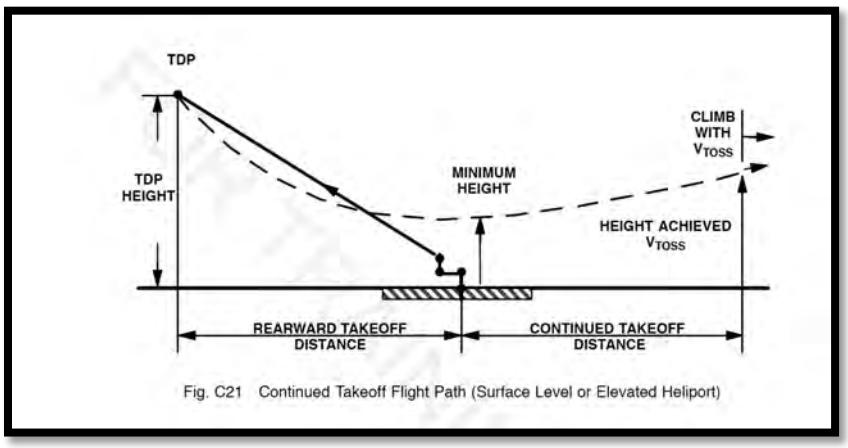


Fig. C21 Continued Takeoff Flight Path (Surface Level or Elevated Heliport)

There are trade-offs in Category "A" procedures for every helicopter type. Although the EC135T2 in the previous drawing can climb to a significant height and help clear obstacles in its path, rearward clearance is a requirement – something that is not in abundance at the CFR heliport.

Referencing the previous drawing, the "minimum height" elevation and the portion named "continued takeoff distance" are critical to determining the highest obstacle a helicopter can clear. After an engine loss a helicopter rapidly descends until the remaining engine increases power and arrests the rate of descent. At this point the pilot increases speed to what is called the "takeoff safety speed" or VToss and starts a climb. Usually the rate of climb is minimal and it may take several hundred metres to gain significant altitude – thus the difficulty for the helicopter to clear obstacles in its path.

Wind Azimuth Constraints

To meet the H1 performance requirement, the RFM has procedures in Category "A" Supplements that must be followed. One restriction consistent among all helicopter RFMs is no downwind operations are permitted. Some helicopters have a narrow arc of allowable wind offset from the helicopter's direction of travel, where others have allowable azimuths of up to 90 degrees from the direction of travel.

Although performance benefits can be realized by most helicopters with a strong wind within 45 degrees of the direction of travel, that can only be assessed after confirming wind strength on approach or departure and when used, provides an extra margin of safety and may allow operations with higher ambient temperatures and/or increased helicopter loads.

Critical or Design Helicopter

A heliport declares the "critical" or "design" helicopter that the heliport specifications are based upon. For an H1 rooftop heliport both terms refer to the overall length and weight of the helicopter. At CFR the Airbus Astar (AS350) is the critical/design helicopter. Other helicopters can use the heliport and some may have better or worse performance than the Astar but all must meet the size and weight criteria.

CONSULTANT

Ron German is the author of this report and the principal of RGHeliservices Consulting Inc. The company provides consulting services on operations and regulatory compliance for heliports and helicopter operations.

The author is a Canadian and United States licenced commercial helicopter pilot, single and multi-engine, VFR/IFR, night endorsed and night vision goggle certified in Canada and the United States. He has flown for several commercial Canadian helicopter companies and as a line pilot with the RCMP Air Services.

Between 2009 and 2014 the author was a Civil Aviation Safety Inspector, Flight Operations with Transport Canada. He was responsible for certification and inspection of all British Columbia heliports, inspection and audit activities on commercial helicopter companies, and has consulted with the Transportation Safety Board on rotary wing accidents. He has been accepted and testified as an expert witness in Canadian and US courts.

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