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THE STRANGE LAKE PEGMATITE–APLITE-HOSTED RARE-METAL DEPOSIT, LABRADOR

Randy Miller
Mineral Deposits Section

ABSTRACT

The Strange Lake deposit is a Middle Proterozoic Zr-Y-Nb-Be-REE deposit located on the Québec–Labrador border. It is hosted by, and genetically related to, a riebeckite–aegirine peralkaline granite, informally known as the Strange Lake or Lac Brisson granite. Most of the known high-grade mineralization occurs within one petrographic zoned pegmatite–aplite lens (Zone 1 lens), situated in the central part of the granite.

The 'Zone 1 lens' is rooted in the roof zone of the adjacent, highly evolved medium grained granite ('exotic-rich'), and crosscuts an older granite phase ('exotic granite') to cover an area of approximately 0.75 km². It is commonly 6- to 10-m thick, and reaches a maximum apparent thickness of 20 m. Parts of the lens have been eroded and the lens locally bifurcates.

The lens is characterized by well-developed textural zoning, in which the pegmatite and aplite phases dominate the upper and lower parts of the lens, respectively. Textural and crosscutting relationships indicate that very fine grained (<0.5 mm), massive aplite was the first phase to crystallize. This aplite, which locally forms a very thin, <0.2-m, upper contact zone, generally occurs as inclusions in the pegmatite and characteristically occurs as a 1- to 3-m-thick lower contact zone. Massive, coarser grained (0.5 to 2 mm) aplite, and an aplite having a prominent mineral lineation, occupy the middle and upper parts of the aplite zone, respectively.

Pegmatite, occupying the upper part of the lens, commonly occurs as a single inhomogeneous phase. Red pegmatite and red aplite commonly form a pegmatite–aplite contact zone in some parts of the lens. Small pegmatite veins (<0.5-m thick) and the rare larger veins (1- to 3-m thick), which generally crosscut most of the aplitic phases, indicate that the pegmatite was the latest phase to crystallize.

The 'Zone 1 lens' appears to represent an incompatible-enriched fluid, which formed in the roof zone of the nearby exotic-rich granite stock. The textural zoning observed in the lens is likely due to a combination of temperature and pressure changes within the fluid. Pegmatite–aplite lenses and veins, occurring throughout the granite pluton, are the main high-grade, rare-metal exploration targets.

INTRODUCTION

The Strange Lake deposit is a Middle Proterozoic rare-metal deposit, which has significant tonnages of potentially economic Zr-Y-Nb-Be-REE mineralization (Miller, 1988). The deposit is hosted by, and genetically related to, a riebeckite–aegirine peralkaline granite, informally known as the Strange Lake or Lac Brisson granite. It is located on the Québec–Labrador border, 150 km west of Nain (Figure 1). High-grade mineralization within the granite commonly occurs as pegmatite–aplite lenses or veins (Miller, 1985). A texturally zoned pegmatite–aplite lens (Zone 1 lens), located in the central part of the granite, contains the most economically significant mineralization.

Regional reconnaissance mapping by Taylor (1979) indicates that the Strange Lake pluton is located within migmatitic and gneissic rocks of the Churchill structural province (Trans-Hudson Orogen). Detail mapping around and within the pluton (Miller, 1986) further indicate that it is younger than the surrounding rocks. It occurs on the contact between older quartzofeldspathic and amphibolitic gneisses and an adamellite or quartz monzonite body, associated with the anorthositic suite (Figure 2). Amphibole from the Strange Lake pluton was reported to have K–Ar ages of 1270 ± 30 Ma (Currie, 1985) and 1163 ± 21 Ma (Pillet *et al.*, 1989), whereas a Rb–Sr whole-rock isochron gives an age of 1189 ± 32 Ma for the pluton (Pillet *et al.*, 1989). The age of the gneissic rocks is thought to be in the range 1800–1750 Ma (Taylor, 1979) and ages from the quartz monzonite suite are in the range 1450–1300 Ma (Hill and Miller, *in press*). Detailed regional mapping in the vicinity of the Strange Lake pluton has recently been completed for both the Québec (Bélanger, 1984) and Labrador (Ryan *et al.*, 1988) regions.

Detailed geology of the Strange Lake pluton was first described by Zajac *et al.* (1984), who based their work on Iron Ore Company of Canada (I.O.C.) diamond-drill hole

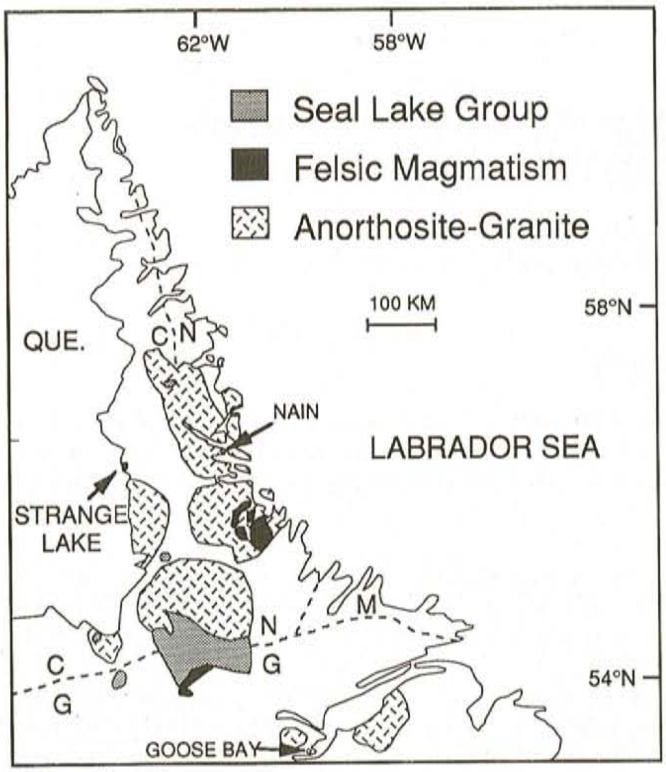

Figure 1. *Location map of the Strange Lake deposit, Labrador. Structural provinces: C = Churchill, N = Nain, G = Grenville, M = Makkovik.*

logging, geophysical interpretations and outcrop mapping. Currie (1985) produced a geological sketch map of the pluton based on his preliminary geological mapping and I.O.C. data. The Québec part of the pluton has also been mapped by Pillet (1985). The geological sketch map in Figure 2 is based on the previous work of I.O.C. geologists and a 1:10,000 outcrop map produced by the author (Miller, 1985, 1986).

The Strange Lake pluton can be divided into three main granitic phases based on the relative proportions of rare-metal and other incompatible element-bearing minerals. These minerals, which are herein termed 'exotic minerals', include the Zr-minerals gittinsite, zircon, elpidite, armstrongite, and vlasovite, the Nb-mineral pyrochlore, the F-mineral fluorite, the Y-minerals gadolinite and kainosite, as well as titanite, allanite, and thorite. The three main phases are: 1) exotic-poor granite, which contains <5 percent exotic minerals, 2) exotic granite, which contains between 5 and 10 percent exotic minerals and, 3) the exotic-rich unit, which is characterized by >10 percent exotic minerals. These three phases are further subdivided by grain size and presence or absence of fine grained darker grey inclusions (Miller, 1985, 1986).

Mineralization at Strange Lake occurs mainly within the exotic-rich phases (Miller, 1985). The highest grade mineralization occurs as pegmatite–aplite lenses and veins, most of which are spatially associated with the exotic-rich stock (>1 km^2) in the central part of the pluton (Figure 2). Exotic-rich pegmatite–aplite lenses and veins crosscut all other phases of the pluton.

The 'Zone 1 lens' of the Strange Lake deposit was one of the main targets of the I.O.C. exploration program. This exploration program included diamond drilling (Hlava and Krishnan, 1980; Venkatswaran, 1981, 1982, 1983; Miller, 1984) and the construction of a bulk sample trench. Drill core, and the bedrock exposure in the bulk sample trench, have made it possible to study the textures, mineralogy and structure of this mineralized pegmatite–aplite lens.

This report summarizes the available geological and mineralogical data from this rare-metal mineralized lens. These data help to determine some aspects of the petrogenesis of: 1) the textural zonation within the lens and, 2) the pegmatite[1]–aplite[2] forming fluids.

THE ZONE 1 LENS

General Structure and Geology

The 'Zone 1 lens' is located in the central part of the Strange Lake pluton, just north and east of a relatively small intrusion (approximately 1.5 km^2) of medium grained exotic-rich granite (Figure 2).

Figure 3 illustrates the subcrop exposure of the 'Zone 1 lens', the isopach contours and the maximum underground extent (0 isopach contour) of the lens as interpreted from the drilling data. These data indicate that the lens underlies an area of approximately 0.75 km^2, has an apparent maximum thickness of 20 m and is most commonly 6- to 10-m thick. The bedrock surface or subcrop map also indicates that approximately a quarter of the lens has been unroofed. Material from the eroded part of the lens forms a well defined boulder train, which led to its discovery (Miller, 1985).

Representative cross-sections through the 'Zone 1 lens' and the adjacent medium grained exotic-rich granite are depicted in Figure 4 a,b and c; (cross-section locations on Figure 3). Some notable aspects of the structure observed in these and other cross-sections are:

1) the lens appears to bifurcate in the central part (Figure 4b),

[1] Pegmatitic rocks or pegmatite is defined as those rocks with: 1) an average grainsize of >5 mm and 2) a majority of original grains (i.e., primary grains before modification by metasomatic or pseudomorphic processes(having subhedral and euhedral textures. In the Strange Lake pluton, some of the medium grained rocks contain a few grains ranging up to 5 or 6 mm in size, but these rocks are distinguished from pegmatites by the dominance of anhedral and subhedral grains and their distinctive chemistry.

[2] Aplitic rocks or aplite is defined in this report as those rocks with: 1) an average grainsize of <2 mm and 2) a majority of original grains having subhedral and euhedral textures. Fine grained granite, containing grain sizes in the range of aplite, is often spatially associated with the Zone 1 lens, but these rocks are distinguished from aplites by the dominance of anhedral and subhedral grains and their distinctive chemistry.

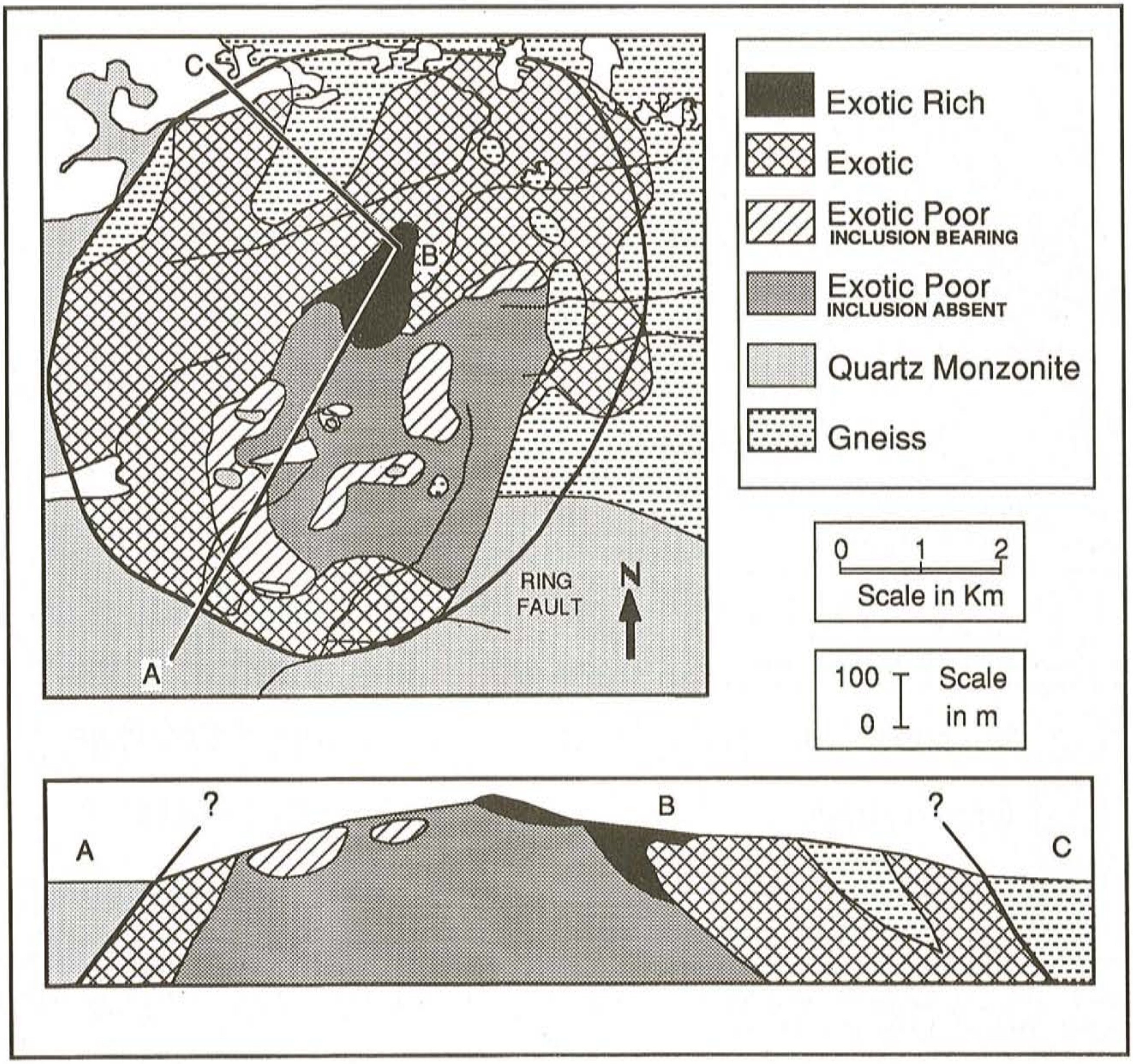

Figure 2. *General geology and cross-section of the Strange Lake pluton.*

2) in the northeastern part, the lens dips to the east and north (Figures 4a and b),
3) the lens dips toward the north in the northern and northwestern parts,
4) the lens rapidly pinches out to the west, north and east (Figures 4a-c),
5) erosion has exposed the lens in the northwestern part (Figures 4a and b),
6) in the south and east, where the lens is greater than 20-m thick, it consists of pegmatite–aplite and medium grained phases, and
7) where the lens is greater than 20-m thick, the pegmatite–aplite phases commonly occupy the upper contact and pinch out southward; pegmatite–aplite zones are rare at the lower contacts of the lens.

These observations indicate that the pegmatite–aplite lens forms a shallowly dipping domal structure, which plunges toward the east. The cross-sections also indicate that the pegmatite–aplite lens is rooted in the adjacent medium grained exotic-rich granite.

Crosscutting relationships suggest that the pegmatite–aplite lens crystallized during and just after the crystallization of the medium grained exotic-rich granite. Both the pegmatite–aplite lens and medium grained exotic-rich granite crystallized after the host exotic granite had crystallized. Core logging indicates that there was very little metasomatism between the lens and the adjacent host rock.

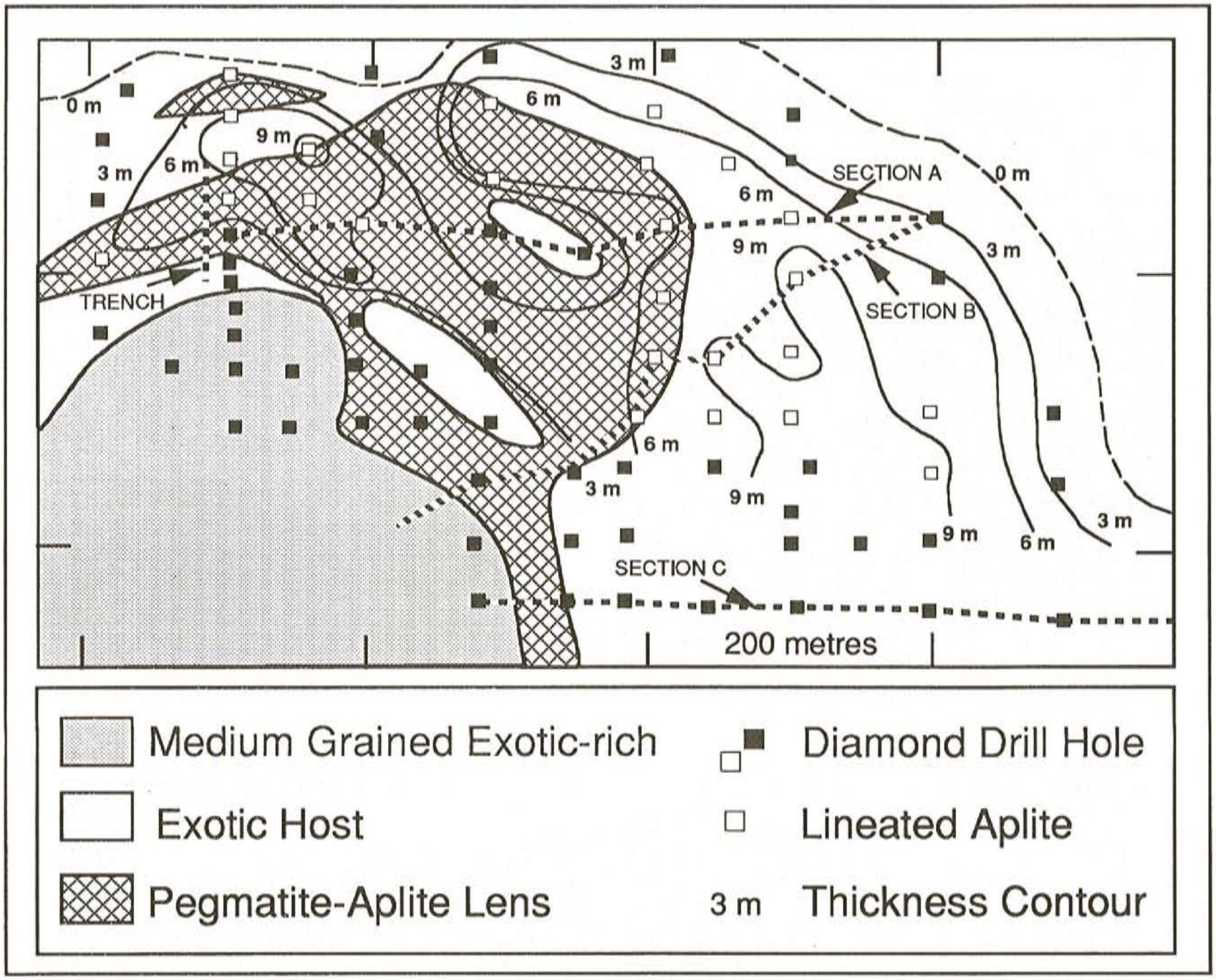

Figure 3. *Geology of the Zone 1 lens with lateral extent (thickness = 0 m) and thickness contours; note that the lineated aplite only occurs where the lens is between 3- and 10-m thick.*

Internal Structural and Geological Variation

Detailed core data indicate that the pegmatite–aplite lens has a well defined internal textural zoning. The internal structure is constant for that part of the pegmatite–aplite lens that has a thickness <20 m (i.e., where the medium grained exotic-rich granite is not found) and for the primary or upper limb of the lens (Figure 4b). The internal zoning is characterized by an upper pegmatitic section (Figure 5) and a lower aplitic section. Figures 6 and 7 are typical cross-sections through the lens, which depict the detailed textural zones.

In the following descriptions, the pegmatite–aplite lens is subdivided into three zones: aplite, pegmatite and pegmatite–aplite contact. Each zone is further subdivided, based on texture, into members: 1) aplite zone–very fine grained, massive and lineated members, 2) pegmatite–aplite contact zone–red aplite and red pegmatite members, and 3) pegmatite zone–very fine grained aplite (inclusion and hanging-wall area) and pegmatite members. Sample units, numbered 1 to 10 (Figure 5), are defined by differing textures, location, mineralogy or colour.

Aplite Zone. The aplite zone, which has an apparent thickness of <1 to 7 m, is subdivided into three textural members (Figure 5): lineated, massive and very fine grained. These members are commonly found throughout the lens, where the thickness is >3 m and <20 m (Figure 3); massive, coarser grained aplite is common wherever the thickness is >20 m.

The fine or very fine grained aplitic member (Unit 1; Figure 5) commonly occurs as a 1- to 3-m-thick unit, at the lower or footwall contact of the lens (Unit 1). This aplite, is characterized by a grain size of <0.5 mm, an equigranular

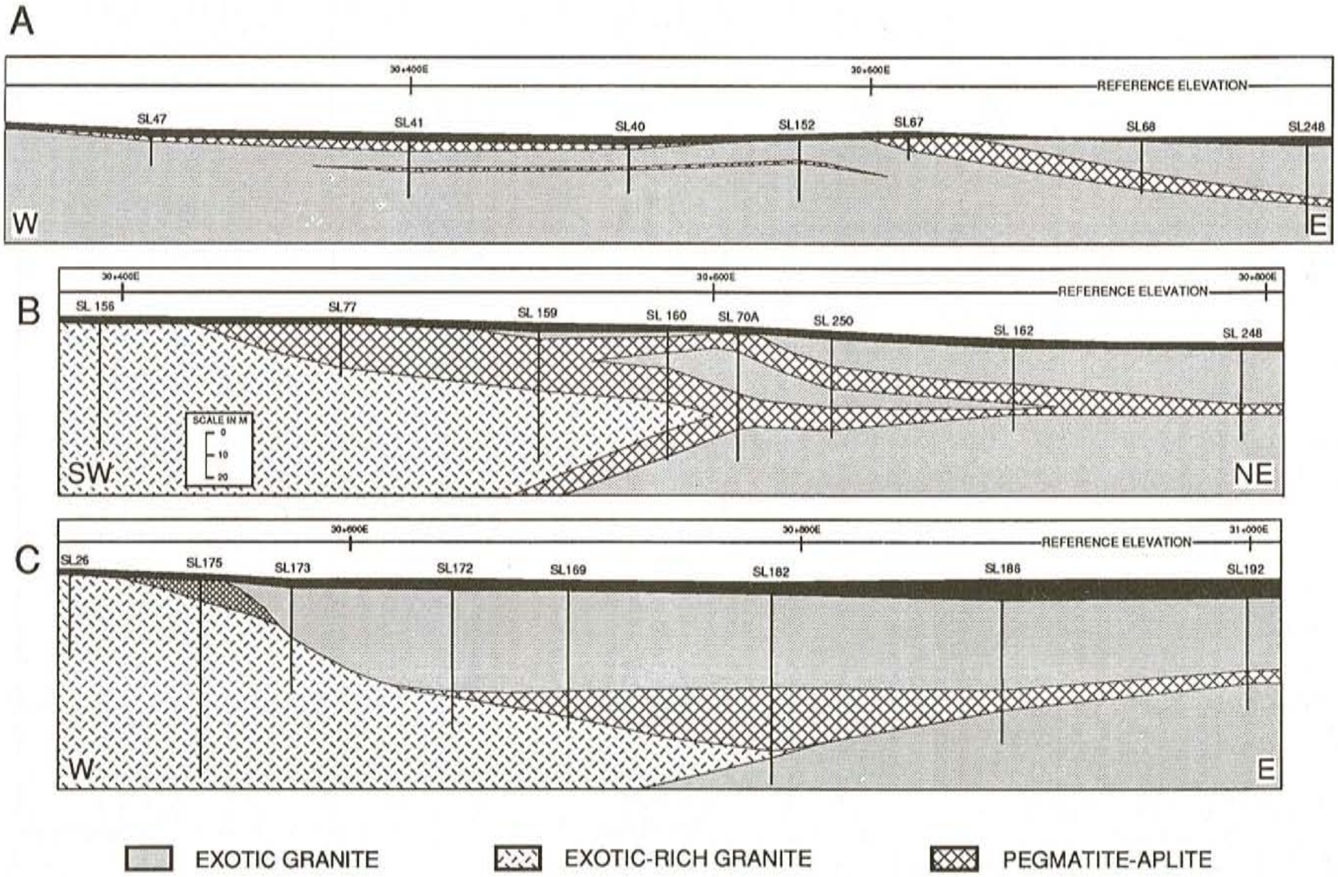

Figure 4. *Geological cross-sections though the Zone 1 lens; Section 41+650N (Section A), a section running SW to NE (Section B) and Section 41+350N (Section C). These sections are located on Figure 3.*

texture, and an assemblage dominated by quartz, K-feldspar and gittinsite associated with minor albite and riebeckite (Figure 8). This aplite has the smallest grain size of all phases in the lens.

A massive and coarser grained aplite (Unit 2) commonly occurs adjacent to the very fine grained aplite (Figure 5). Unit 2 massive aplite ranges in grain size from 0.5 to 2 mm and the unit ranges in thickness from 0 to 3 m; it is commonly 1-m thick. The mineral assemblage is very similar to that of the very fine grained aplite (Unit 1), although albite is slightly more abundant and minor aegirine occurs in Unit 2. This unit commonly contains irregular red hematized patches ranging in size from 1 to 5 cm across. The massive aplite locally contains fine grained (<0.5 mm) and coarser grained (about 2 mm) riebeckite populations. This member rarely contains comb-structures defined by layers of differing grain size or mineral abundances.

Lineated aplite (Units 3, 4 and 5) is found in the upper part of the aplite zone in contact with the pegmatite–aplite contact zone. The lineated aplite is characterized by albite, narsarsukite and elpidite pseudomorphs, thorite, and aegirine mineral lineation. This member ranges from 0.5- to 4-m thick, and has a grain-size range of 0.5 to 2.0 mm. The mineral assemblage varies systematically from the bottom (Unit 3) to the top (Unit 5) of this member (Figure 8): aegirine and albite abundances increase upward, whereas amphibole and microperthite abundances decrease upward; the abundance of narsarsukite pseudomorphs, thorite and a Y-rich, unnamed mineral also increase upward. The upward increasing abundances of elongate minerals, such as thorite and albite, result in an enhancement of the lineated texture; there is a gradational change from massive to lineated texture at the lower contact of this member.

Pegmatite–Aplite Contact Zone. The pegmatite–aplite contact zone commonly consists of an aplite member (Unit 6) and a pegmatite member (Unit 7), which are characterized by a reddish-brown, red or purplish-red colour. The distinctive colouration is due to the presence of hematized gittinsite, thorite and fluorite.

The red aplite member (Unit 6) continues most of the mineral trends observed between and within the aplitic units (Units 1 to 5): aegirine is the only mafic mineral, and thorite and narsarsukite pseudomorph abundances increase (Figure 8). Contrary to a previous trend, the abundance of microperthite is much higher and there is only a trace of albite. The red aplite only occurs at the upper contact of the aplite zone in association with the red pegmatitic member. Its grain size varies from 0.5 to 2 mm. This unit is up to 0.5-m

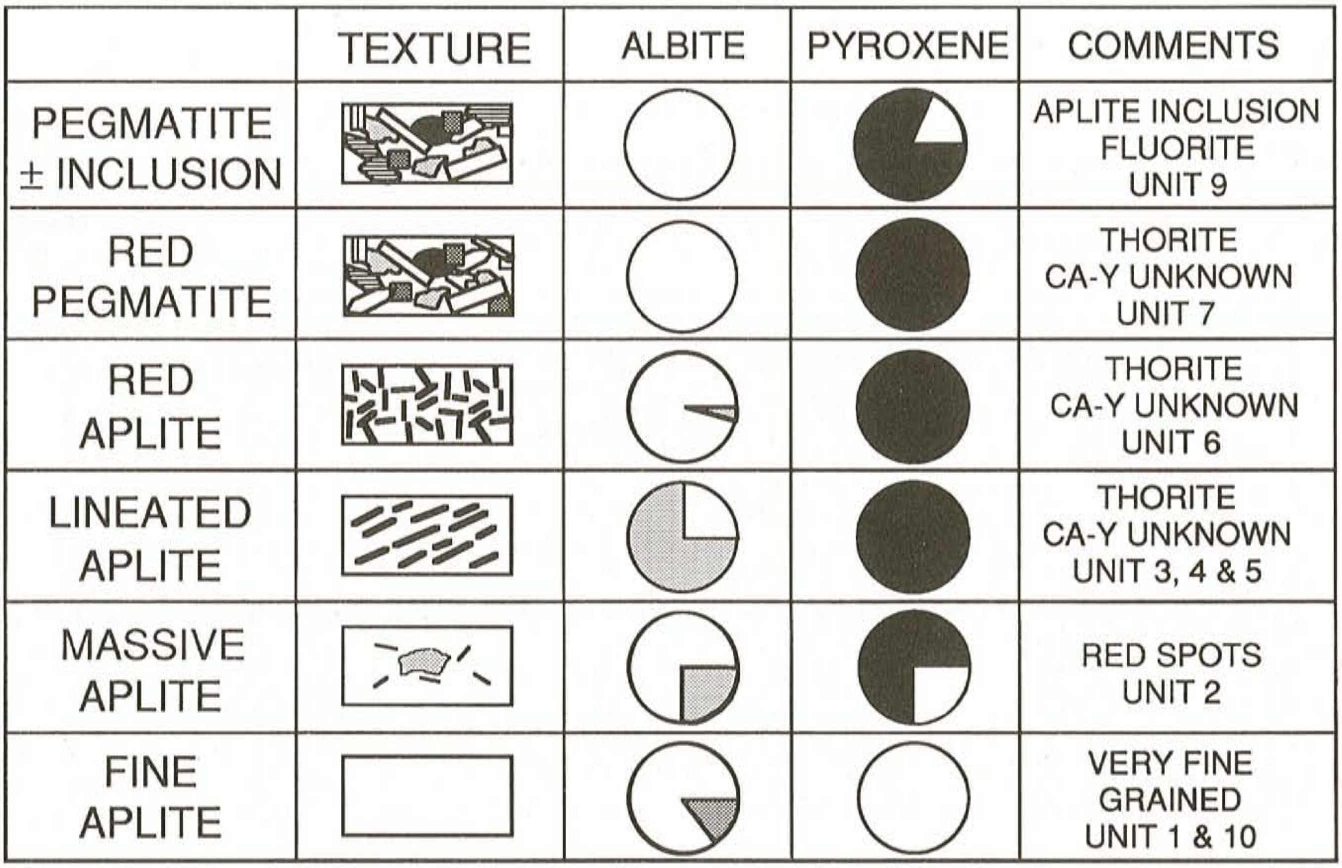

Figure 5. *Idealized section through the Zone 1 lens; the section illustrates the mineralogy and textural features of the geological units within the lens. The albite pie diagrams refer to the proportion of albite out of the total feldspar content. Pyroxene diagrams refer to the proportion of pyroxene out of the total pyroxene + amphibole content. (Unit 8 is a small pegmatite vein and has not been illustrated or discussed in the text).*

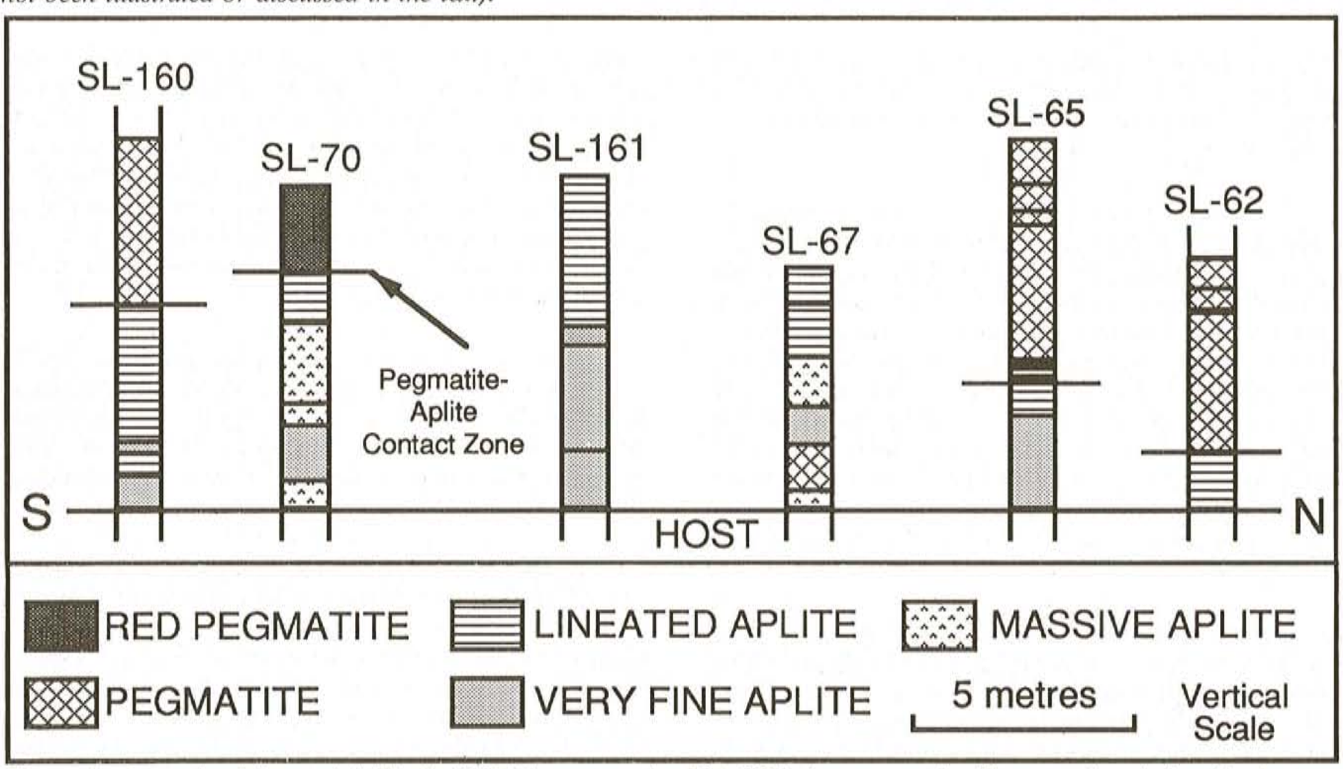

Figure 6. *Example of diamond-drill hole (D.D.H.) cross-section 30+600E; the cross-section illustrates the relationships between the various aplite and pegmatite units within the lens. Note that D.D.H. SL-160 and D.D.H. SL-62 are the only holes in this section that cut the hanging wall.*

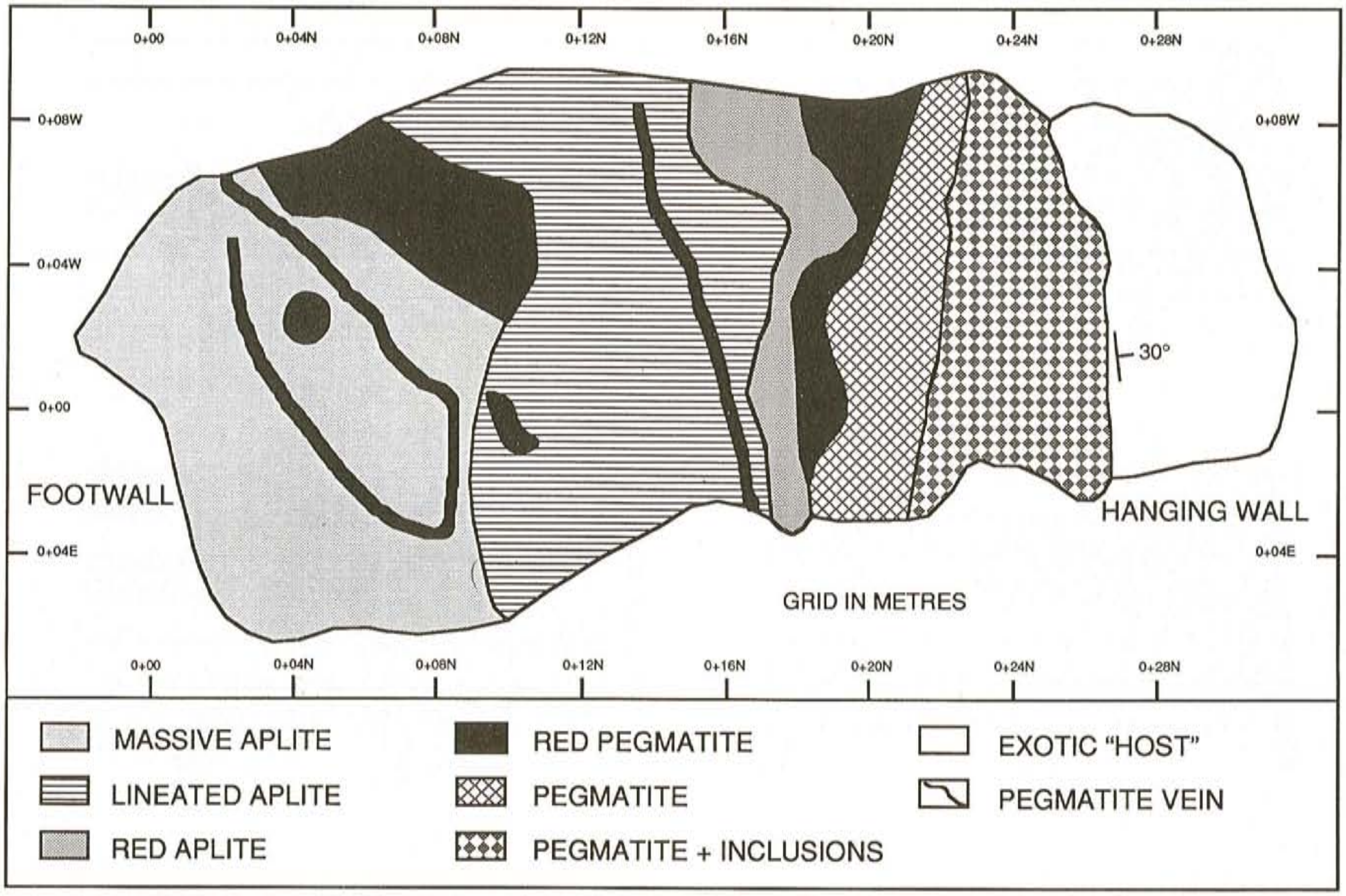

Figure 7. *Geology of the bulk sample trench (see Figure 3 for trench location); it illustrates the relationships between the various aplite and pegmatite units within the lens.*

thick and is only found in the northwest part of the Zone 1 lens.

The red pegmatitic member (Unit 7) varies in thickness from 0.5 to 3.5 m, and has a gradational contact with the overlaying pegmatite zone (Unit 9). It has a slightly wider distribution than the red aplite but is similarly confined to the northwest part of the lens. The texture is dominated by pseudomorphs, turbid alteration products and mineral aggregates, thus it is very difficult to identify the original minerals. Microperthite is the main feldspar, thorite is abundant and aegirine is the dominant mafic mineral. Fluorite is much more abundant here than in any of the aplitic units. Small pegmatite veins (<0.5-m thick) crosscut all the aplite-zone units (Units 1 to 5).

Pegmatite Zone. The pegmatite zone consists of a massive inhomogeneous pegmatitic member (Unit 9) and a discontinuous, poorly defined, very fine grained aplite member (Unit 10). These members form a zone that ranges in thickness from 0.5 to 8 m. Texturally similar veins (<0.2-m thick) and thicker (1 to 3 m) pegmatite units rarely occur at or near the lower contact of the lens. The thicker units commonly contain inclusions of very fine grained aplite similar to the Unit 10 aplite found in the pegmatite zone.

The pegmatite member (Unit 9) is very inhomogeneous due to its variable grain size, which ranges from 1 to 20 mm, and its variable colour that ranges from brown to beige to yellow to green to purple. Mineral inhomogeneity is also characteristic, as various minerals are dominant in uncorrelated parts of the lens (e.g., quartz-rich or fluorite-rich patches). This inhomogeneity makes it difficult to define any mineral trends within the unit. General mineralogical observations are: 1) aegirine is generally more abundant than riebeckite throughout the pegmatite, 2) microperthite is more abundant than albite, 3) thorite is less abundant than in the red pegmatite, and 4) fluorite is more abundant than in the aplite zone.

The aplite member (Unit 10) occurs as a <0.2-m, discontinuous unit on the upper or hanging-wall contact. Inclusions (<2 to 5 cm) of texturally similar aplite occur in the upper pegmatite member (Unit 9) near the upper contact (i.e., near the discontinuous very fine grained unit). These inclusions probably represent the remnants of a relatively thick, very fine grained marginal phase, which was subsequently disrupted by crystallizing pegmatitic fluid.

Mineral Variation

The abundance and presence/absence data for a particular mineral, systematically vary throughout the vertical extent

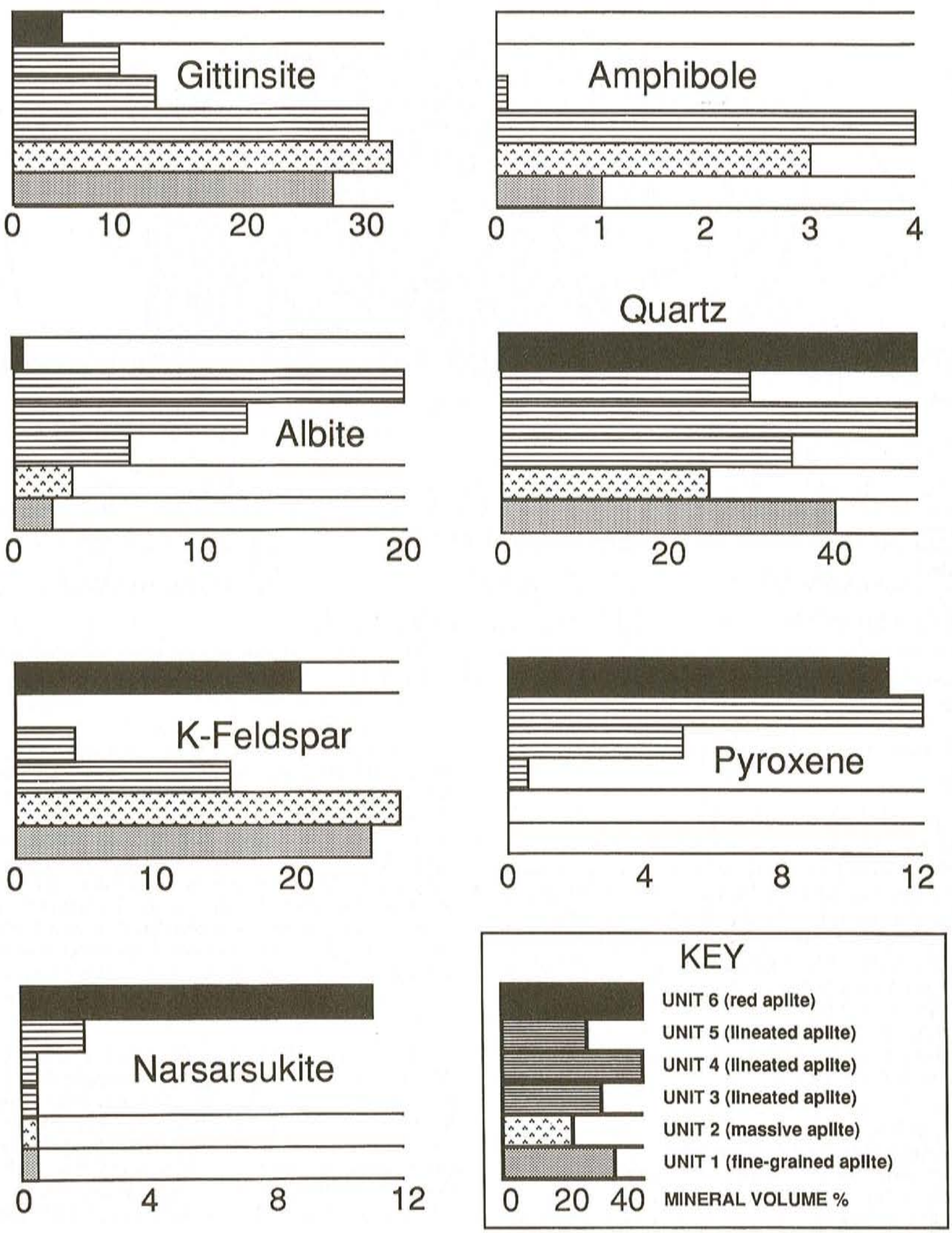

Figure 8. *Relative position within the lens verses mineral percent values of the aplitic units; the figure illustrates the variation of mafics, feldspars, quartz and rare-metal minerals with their location in the lens.*

Table 1. Summary of relative age relationships. The oldest units are at the bottom of the table and the youngest units are at the top. The relative ages are well estabilshed by the field and drill core data except for the interpreted contemporaneity between the lineated aplite and the upper pegmatite

Unit 6 & 7	Pegmatite–aplite contact zone	red pegmatite (Unit 7) cuts all aplites except red aplite (Unit 6) with which there is a gradational contact
Unit 4 & 5	Upper lineated aplite	grades into Unit 6 aplite; probably contemporaneous with Unit 9 pegmatite
Unit 9	Upper pegmatite	grades into Unit 7 pegmatite; probably contemporaneous with Units 4 and 5 aplite
Unit 3	Lower lineated aplite	older than Unit 4 and has a gradational contact with Unit 2 as the lineation becomes poorly defined
Unit 2	Massive aplite	older than Unit 3; gradational contact with Unit 1
Unit 1 & 10	Hanging–footwall contact	very fine grained lower contact unit (Unit 1) and aplite inclusions (Unit 10) in upper pegmatite (Unit 9); best estimate of the original composition of the fluid introduced into the lens

of the 'Zone 1 lens'. These changes often correlate with the textural changes previously described. Some of the most significant changes include: the variation in the absolute contents of the feldspars and mafic minerals, and the variation of the relative proportion of albite to total feldspar and pyroxene to total mafics. These variations are summarized in the pie charts of Figure 5 and the bar charts in Figure 8.

The variation of feldspar proportions (Figure 5) indicates that albite is more common in the aplite zone, where it ranges from 5 percent of the total feldspar to a peak of 75 percent. Albite proportions and abundances are very low (<5 percent) in the pegmatite zone (Unit 9), whereas conversely, the proportion of microperthite is highest. Microperthite is the most abundant feldspar throughout the lens, with the exception of the upper-lineated aplitic units (Units 4 and 5), which contain only small amounts of microperthite.

The variation in the proportion of pyroxene to total mafics (pyroxene + amphibole) is more systematic than the feldspar proportional data. Amphibole is relatively more abundant in the two members (Units 1 and 9) in contact with the host granite. The very fine grained aplite (Unit 1) at the lower contact, contains no pyroxene, whereas the pegmatite–aplite contact zone in the central part of the lens and the adjacent lineated aplite (Unit 5), in the aplite zone, contain no amphibole. The proportions in the other members vary between these extremes.

The other major minerals in the lens are quartz and gittinsite (pseudomorph after elpidite or possibly after another zirconium silicate). Quartz abundances are fairly erratic in the aplitic members, and variable, but difficult to estimate in the pegmatitic members. Gittinsite abundances are relatively constant for the bottom three aplitic units (Units 1, 2 and 3), in which they are 30 to 40 percent, but they drop to less than 5 percent in the red aplite (Unit 6) of the central pegmatite–aplite contact zone. The upper-pegmatite unit (Unit 9) contains >10 percent gittinsite.

Mineral variations are also observed for trace or minor minerals having abundances of <1 to 10 percent. It is very difficult to track these variations in the pegmatitic members. Some general observations for these minerals are: 1) thorite is present in more than trace amounts in the central pegmatite–aplite contact zone and in the uppermost lineated aplitic unit (Unit 5), 2) the Ca–Y unknown mineral is found only in those units with abundant thorite, 3) fluorite is most abundant in the pegmatite members, and 4) narsarsukite is most abundant in the thorite-rich units.

Summary of Relative Age Relationships

Crosscutting and textural data suggest the following relationships within and between the three textural zones:

1) units in the aplite zone (Units 1 to 5) appear to have been formed from the same fluid during a period of upward crystallization and differentiation, thus the aplites young upward;
2) the similarity of colour and mineralogy, and the gradational contact between the two members (Units 6 and 7) in the pegmatite–aplite contact zone, suggests that they crystallized at the same time;
3) a pegmatite unit crosscuts units of the aplite zone, and therefore is younger, and;
4) a red pegmatite vein crosscuts all units of the aplite zone confirming that the pegmatite–aplite contact zone is the youngest section.

These and other age relationships are summarized in Table 1.

DISCUSSION

Model for Pegmatite Formation

Geological and structural data from both the lens and the nearby exotic-rich intrusion have provided data to postulate

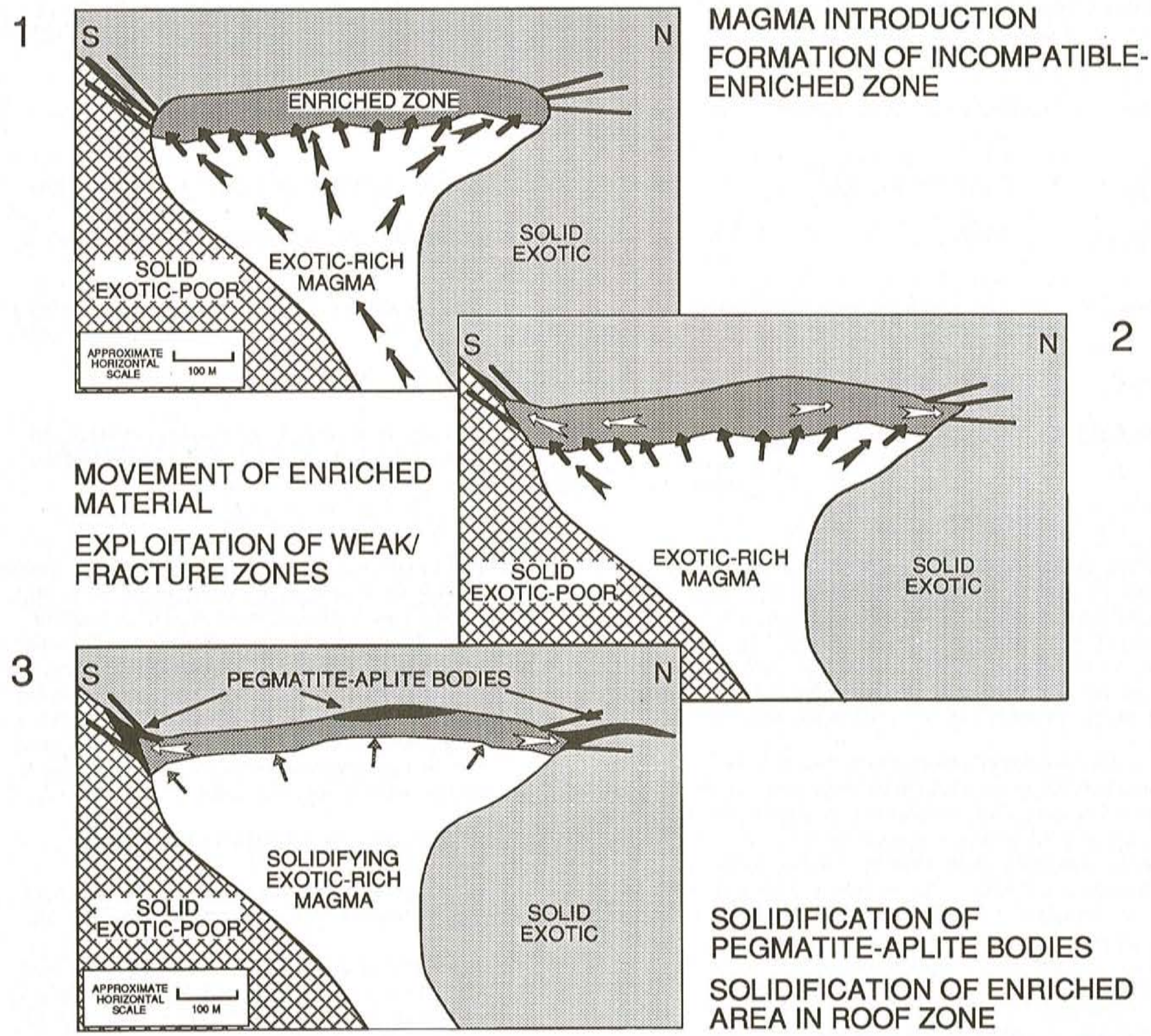

Figure 9. *General model for the formation of the exotic-rich stock and the Zone 1 lens within the Strange Lake pluton. Diagram 1 is the initial stage of the process, whereas diagram 3 is the final stage.*

a sequence of events leading up to the formation of the Zone 1 pegmatite–aplite lens. This sequence of events is illustrated in the three parts of Figure 9.

The initial stage involves the intrusion of an exotic-rich magma along the contact between the previously crystallized exotic and exotic-poor phases of the peralkaline granite. Fracturing, as a result of the intrusion of the magma, occurred along the contact zone between these phases and also into the exotic phase along contact zones between textural subvarieties. Incompatible and volatile elements were, in the meantime, being concentrated in the upper portion of the magma body by a combination of thermal, gravitational, fractional crystallization and volatile transport mechanisms.

Stage two involves the movement of incompatible- and volatile-rich fluid into the fractures being formed along contact zones. The fluid in the lower portions of the magma body is beginning to solidify and thus does not have much effect on the fluid in the upper portion of the chamber.

The final stage results in the formation of pegmatite and pegmatite–aplite lenses or dykes in the fracture zones, along the roof zone of the magma chamber and crosscutting the solid portions of the magma chamber.

Model of Pegmatite–Aplite Zoning and Formation

Stratigraphic, crosscutting and petrographic data from the various textural units within the lens have been synthesized

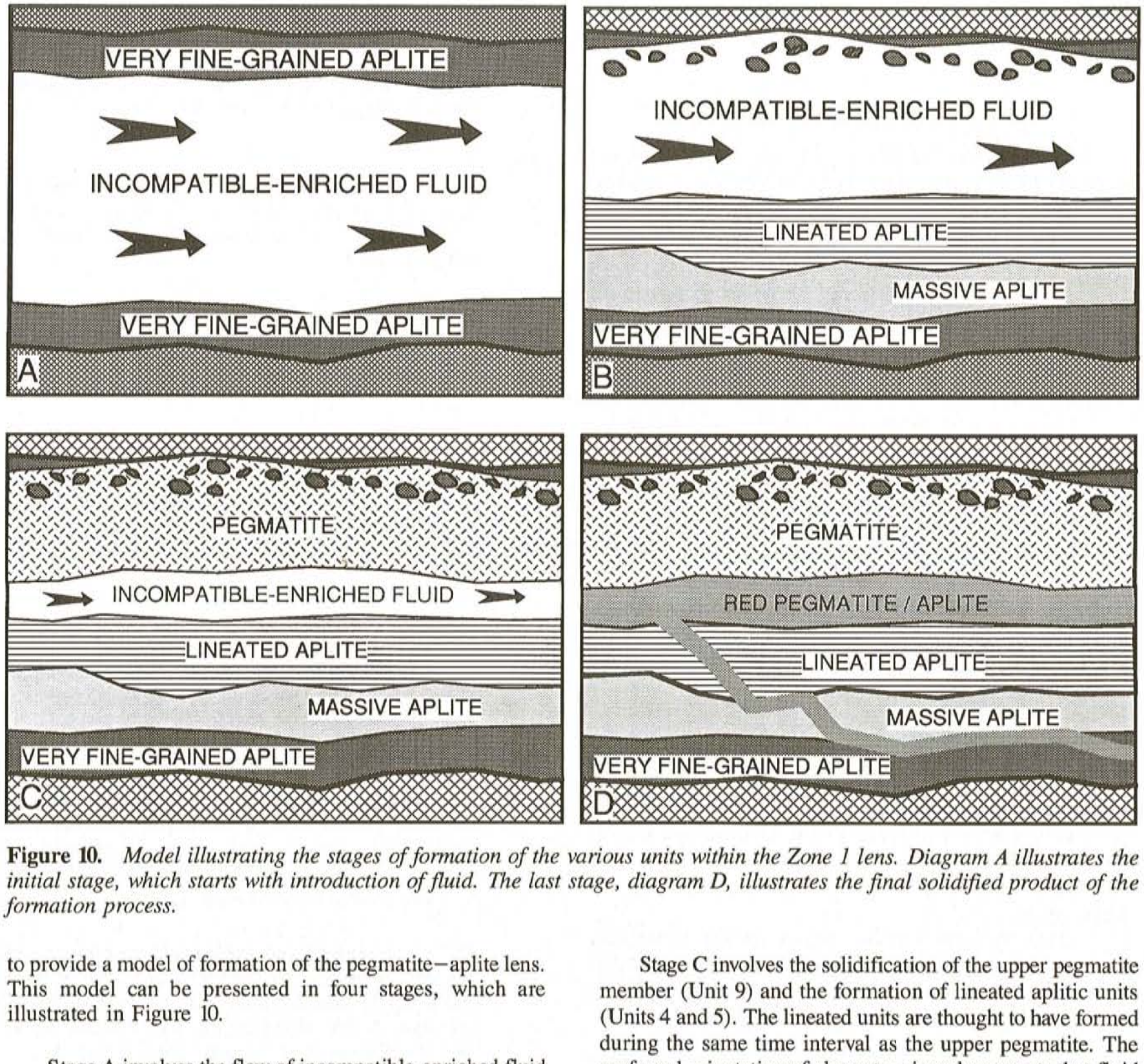

Figure 10. *Model illustrating the stages of formation of the various units within the Zone 1 lens. Diagram A illustrates the initial stage, which starts with introduction of fluid. The last stage, diagram D, illustrates the final solidified product of the formation process.*

to provide a model of formation of the pegmatite–aplite lens. This model can be presented in four stages, which are illustrated in Figure 10.

Stage A involves the flow of incompatible-enriched fluid into the fracture zone along the contact between the two textural subvarieties of the exotic peralkaline granite. Rapid freezing along the relatively cold contacts of the channelway resulted in the formation of an upper and lower, very fine grained aplite chill margin (Unit 1 on the lower contact and Unit 10 inclusions on the upper contact). Fluid flow continues within the central portion of the lens.

Crystal formation within the lens, volatile migration toward the upper portion of the lens and cooling are the major mechanisms in operation during the second stage (Stage B in Figure 10) of formation. The formation of K-feldspar and Zr-silicate crystals results in the accumulation of these minerals in the lower part of the lens (Units 2 and 3), while volatiles are migrating toward the roof zone. The increase in volatiles in the upper pegmatite zone and the confinement of flow to a smaller cross-section results in the breakup of the upper, very fine grained aplite chill zone.

Stage C involves the solidification of the upper pegmatite member (Unit 9) and the formation of lineated aplitic units (Units 4 and 5). The lineated units are thought to have formed during the same time interval as the upper pegmatite. The preferred orientation of elongate minerals suggests that fluid flow was still occurring in this stage. The solidification of the upper pegmatite occurred during and just after the period of breakup of the upper, very fine grained aplite chill zone (Unit 10) in Stage B. This resulted in the entrapment of aplite inclusions within the upper parts of this pegmatite. The remaining fluid is confined to the central portion of the lens between the solidified pegmatite and aplite zones.

The final stage (Stage D) results in the formation of the extremely enriched red pegmatite–aplite pair in the pegmatite–aplite contact zone. This pegmatite–aplite pair appears to have been formed by the same differentiation processes as those which formed the pegmatite zone–aplite zone pair. Each pair involves the formation of fine grained, volatile-poor lower members and coarser grained, volatile-rich upper members. The pegmatitic fluid also exploited cooling fractures within the lens to crosscut the solidified aplite members in the form of veins and dykes during Stages C and D.

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NOTE: Geological Survey Branch file numbers are included in square brackets.