

ABSTRACT

A large assemblage of systematically collected fossils from the Middle Cambrian Raymond Quarry Member of the Burgess Shale was analyzed in order to resolve the palaeoecology. Sediment and fossil evidence shows that the constituent fauna was largely autochthonous. The degree and extent of soft-bodied preservation serves to illustrate that taphonomic filtering had a variable but presumably minor effect. Behavioral aspects of some organisms in the trophic nucleus are discussed with respect to fossil evidence. Epifaunal tiering is shown to have achieved considerably higher (i.e., more modern) levels than previously thought. Identifiable prey within the gut cavities of their predators allows the reconstruction of a trophic web that includes secondary (and probably tertiary) carnivory. Changes in the composition of the Raymond Quarry fauna over time appear to reflect a combination of increased taphonomic filtering and an environmental shift that included increasing bottom oxygenation, perhaps related to the trend of decreasing water depth.

Keywords: Burgess Shale, Raymond Quarry, Middle Cambrian, palaeoecology

CHAPTER 1: INTRODUCTION

1.0 General introduction

The first Burgess Shale organism was described by Whiteaves (1892), but it was not until Charles Doolittle Walcott's discovery of the 'Phyllopod Bed' in 1909 that widespread attention was given to the deposits. Most of the soft-bodied Middle Cambrian organisms preserved in the shale had never been seen before, but Walcott's early descriptions were only of a preliminary nature (Whittington 1971a). Many of the organisms have since received more detailed treatment, and that work continues to the present day. New and undescribed taxa continue to be identified, particularly in collections acquired by Royal Ontario Museum (ROM) expeditions led by Desmond H. Collins. The ROM fossil collections of Burgess Shale fossils are the most comprehensive by locality (Collins et al. 1983), and by measured stratigraphic levels of occurrence (Devereux et al. 1998). The size of the collections and the careful methods employed during collection permits the study of individual faunae in terms of associated taxa, as well as changes in community composition over time.

1.1 Purpose of study

Middle Cambrian soft-bodied fossils provide a rare opportunity to study organisms and communities that are normally lost to taphonomic filtering. Unfortunately, the earliest collections from the Burgess Shale did not include stratigraphic data, and this resulted in the permanent loss of information. The most comprehensive study of the

Burgess Shale to date (Conway Morris 1986) was therefore unable to assess distinct communities or changes in faunal composition over time.

This thesis is an attempt to more accurately consider a Middle Cambrian fauna by taking advantage of carefully recorded stratigraphic data and notes on fossil distribution relative to a submarine cliff (the Cathedral Escarpment). The Raymond Quarry fauna was selected as the best candidate because of its large sample size, as well as stratigraphic and lateral range. Outcrops of Raymond Quarry-equivalent strata and fossils across the Kicking Horse Valley on the shoulder of Mt. Stephen (Fletcher and Collins 1998) confirm that this fauna was not geographically isolated. Significantly, the Raymond Quarry fauna also appears to be autochthonous.

An autecological review of the major taxa is necessary to confirm or debate previous research, and to present important new information regarding the evidence for specific life habits and feeding strategies. One new taxon is abundant enough to be considered in some detail, and this highlights the need for future taxonomic consideration.

Synecology is presented in the context of changes in faunal composition over time in order to determine whether those changes were due to taphonomic filtering, evolutionary modification, or environmental variability.

Major findings are summarized with a general comment on contributions made in this thesis toward understanding a critical period of metazoan evolution and the ecological patterns established by Middle Cambrian time.

1.2 Location

The principal Burgess Shale site (Figure 1) is located about 5 km north of the town of Field, British Columbia, on a ridge connecting Mt. Field and Wapta Mtn. ('Fossil Ridge'). Additional exposures are known (Collins et al. 1983), including outcrops on Mt. Stephen that are lithologically and biostratigraphically equivalent to the Raymond Quarry Member (Fletcher and Collins 1998).

1.3 Materials and methods

1.3.1 *Collections included*

All material analyzed in this thesis is curated at the Royal Ontario Museum (Toronto), department of Palaeobiology (Invertebrate Palaeontology). Fossils collected by ROM field parties during 1991, 1992 and 1993 from beds excavated in the Raymond Member were used, but not those collected during the 1997 season, except as anecdotal specimens. Material from the latter season was awaiting preparation at the time of data collection (summer of 1998). The ROM collections were studied while specimens were stored by sequentially assigned numbers corresponding to order in which specimens were recorded in the field (see below). The Raymond collections have since been re-sorted by stratigraphic level of occurrence and by the fossil taxa recorded in the field.

1.3.2 *Permission*

Collection of fossils within the boundary of Yoho National Park is strictly prohibited under the National Parks Act, except by permits granted by Canadian Parks Service, subject to approval by the Yoho Park Superintendent. Numerous permits have

been granted to Desmond Collins, ROM Senior Curator (Palaeobiology) to excavate fossils in the Burgess Shale Formation, including the 3 seasons (1991-- 1993 inclusive) from which this work is derived.

1.3.3 Access to the Raymond Quarry locality

Access to the excavations was gained by helicopter, and through Parks-maintained hiking trails connecting Takakkaw Falls to Field, B.C. by way of Burgess Pass. Camping equipment and supplies were flown by helicopter from a horse ranch located about 6 km west of Field. Snow-free conditions, occurring mostly during July and August, allowed excavations to last about eight to ten weeks in each field season.

1.3.4 Excavation and specimen removal

Teams of eight to ten field assistants undertook the excavations. Permission to use explosives was not granted, and the majority of the physical work utilized hand-tools. Snow and overburden removal was necessary at the beginning of each season. Vertical bedding measurements were determined from an arbitrarily assigned RQ 10.0 m level (equivalent to 21.6 m above the base of C.D. Walcott's excavations in the Phyllopod Bed; see Table 1). As fossils were uncovered, they were immediately labelled according to the bed of occurrence, to the nearest decimetre. Specimens that occurred exactly between two measured levels were labeled according to the higher level. Trimming, cataloguing and packing was done on site.

1.3.5 Potential for collecting bias

Certain taxa are potentially under-represented in the fauna because of collecting bias during excavations. Again, the degree to which this may have occurred must be taken into consideration. In assessing total numbers of individuals, certain conditions existed in which fossils may have escaped notice, were unrecognizable, were accidentally destroyed or were so common that only exceptional examples were retained. These conditions are discussed briefly below.

The number of fossils rendered invisible by adverse conditions in the field cannot be determined exactly, but the effect would have been the same for most organisms, and would have approximated their proportions recovered under more favourable conditions. For example, some *Marpolia*-like algal remains may have escaped notice, as they were usually visible only on weathered slabs (often excavated in the previous year). There is some under-representation of the macro-algal component of the community, but it was clearly always a minor contributor.

Unidentifiable remains were commonly observed on excavated slabs in the field. Most of these fossils were discarded unless they were deemed to possess patterns or structures that might later be identified in the laboratory. Some of these were identified (and included among faunal counts), but most remained indeterminate.

Because of limitations placed on the quantity of specimens removed from Yoho National Park, some very common fossils were discarded in favour of quality. For example, localized shell hash lenses, containing disarticulated brachiopod valves (*Micromitra*, *Nisusia* and *Diraphora*), hyolithid conchs (*Haplophrentis*) and assorted trilobite sclerites (mostly *Ehmaniella* and *Pagetia*) were collected only occasionally. Monoplacophorans (c.f. *Helcionella*, *Scenella*) were later identified on a few slabs. Shell

hash lenses were not included in faunal counts, as they appear to have been (transported?) death assemblages.

Fragmentary remains of the sponge *Vauxia* were locally abundant on some bedding planes, and these were usually discarded when lacking a base. Since these were not a part of the living community prior to burial, their exclusion from faunal counts has no significant effect on the reconstruction of Raymond ecology.

Pollingeria is under-represented in the Raymond collections. Many specimens were collected as discrete groups, and on slabs associated with other taxa. Local patches of extremely numerous individuals were observed near the location of the original Raymond Quarry, but preservational quality was poor, and many specimens appeared to have undergone considerable decay prior to burial. An exact count of these organisms was impossible, and those included in the fauna must be considered as some portion of the original whole population.

1.3.6 *Laboratory work*

Laboratory preparation of specimens was conducted at the ROM. Preparation included washing and acid treatment to remove secondary carbonate crusts, as well as repair to broken specimens. A low-power binocular microscope and electric engraver was used to remove matrix bound to the fossils, where appropriate. Photography was conducted using a digital camera and variably directional lighting to highlight specific aspects of specimens. Where necessary, some specimens were photographed wet.

1.3.7 *Assessment of the collection*

Fossils were identified following preparation, and many specimens required re-evaluation of their initial field identifications (i.e., according to the original catalogue). Counts of individual organisms were made on each slab, and recorded (if possible) at the taxonomic rank of genus. Notes were made where fossils appeared to represent moult remains and/or disarticulated material. Incomplete specimens were judged to be non-living components of the fauna at the time of burial, except for some of the dinocarids, where an assemblage of 'soft' body parts were deemed sufficient evidence of a whole animal. Occurrence of algae on a slab was registered as a single specimen (c.f. Conway Morris 1986) since determination of discrete algal "units" was usually impossible. In the case of *Margaretia*, individual 'fronds' were counted as a single unit. The majority of animals were unproblematic to count, except for the sponge *Vauxia*; these were assessed by individual branches. In total, 9239 individual fossils were identified. From this, 1457 were deemed incomplete and 233 unidentifiable, leaving 7549 fossils to reconstruct the living community. Some 68 taxa were recorded (Appendix I), and these were assigned to basic trophic categories according to previous literature, morphology, and gut contents when they were identifiable.

A version of the 'trophic nucleus' was identified for the whole Raymond fauna, based on numerical dominance of fossil taxa. Aspects of organismic autecology of the dominant taxa were then reviewed and, where appropriate, amended according to evidence provided by the fossils (in Chapter 3). The only previously undescribed organism found to occur with sufficient abundance to warrant inclusion within the Raymond Quarry trophic nucleus were the 'undescribed medusoids'; a brief description of

the functional morphology of this organism, including diet and probable life habits, is provided in Sections 3.11.3 and 3.11.4.

1.3.8 Relative and absolute diversity trends

Relative diversity of organisms for each decimetre interval of strata was calculated using the Shannon-Wiener index (Appendix II):

$$H_s = - \sum_{i=1}^s P_i \log P_i$$

where 's' is the number of taxa present in each decimetre interval of sediment and ' P_i ' is the relative abundance of the i^{th} taxon (a proportion from 0 – 1.0). The negative sign is added by convention so that H_s is always a positive number. The result is a measure of comparative uncertainty; a larger value indicates less certainty about the predictability of encountering a specific taxon in the assemblage represented at any given sedimentary horizon. For example, the poorly sampled RQ 7.5 m level has produced only one taxon (in this case, *Leancoilia*), and the theoretical uncertainty is zero; i.e., the expectation is that the next fossil encountered will be *Leancoilia*. H_s is greatest when all species are equally abundant, and also increases without an upper bound as the absolute diversity (total number of taxa) increases. Large numbers of a single taxon proportionately to others in a given assemblage lowers the value of H_s , perhaps disproportionately for animals exhibiting a patchy distribution, and especially when the areal extent of the investigation is limited).

Absolute diversity (T) refers to the number of separate taxa in a given interval, and usually refers to genera. In some cases (e.g., *Choia*, chancelloriids,) more than one species or even genera may be included together. The effect of lowering absolute diversity is minimized somewhat by the ecological (i.e., functional) similarities of the groups that are combined.

1.3.9 Biovolumetric estimates

Biovolumetric estimates of taxa comprising the Raymond Quarry faunal nucleus were calculated (Table 2) in a manner similar to that employed by Conway Morris (1996). Each taxon was reduced to a geometric shape with estimated dimensions approximating an average-sized individual (Appendix III). The total number of individuals was used to obtain a total biovolume, in cm^3 . The inherent inaccuracy of this method allows only a rough estimate of concordance to be made between numerical abundance and total ecological space utilized by a given taxon. Nonetheless, this information can be applied to generalized trophic categories to assess their relative importance.

1.4 History of Raymond Quarry excavations

C.D. Walcott's personal diary entry for September 1, 1909 (Figure 2) states: "We continued collecting. Found a fine group of sponges on slope (in situ)". He included a drawing of *Vauxia* and a chancelloriid, presumably to indicate the sponges he mentioned. The following day, Walcott was "Working high up on the slope." Together, this evidence suggests that Walcott and his collecting party was above the level of the Phyllopod Bed (Briggs et al. 1994). The fossil sponges occur more abundantly at the present level of the

Raymond Quarry. It therefore appears that the source of Raymond Quarry fossils was discovered before the Phyllopod Bed. Excavations by Walcott and later parties centered on the latter deposits, owing to their higher level of productivity and quality of preservation. Walcott labeled the few Raymond Quarry fossils he collected with the notation '35k/10' (Walcott 1912a, b).

Percy E. Raymond of Harvard University was the first person to actively quarry fossils at the stratigraphic level that would later bear his name. In the summer of 1930, Raymond collected for 15 days, mostly reopening Walcott's quarry, but mentions that "a second layer, higher up on the mountain, proved to be very fossiliferous, yielding many excellently preserved worms, sponges and crustaceans" (Raymond 1930, p. 32).

Raymond's Quarry remained essentially untouched until it was reopened by the Geological Survey of Canada (GSC), as part of 'Operation Bow-Athabasca' (Price 1967). Although, as in previous excavations, efforts were concentrated on the Phyllopod Bed in 1966 (Aitken et al. 1967) and 1967 (Aitken and Fritz 1968), with some 600 ft³ (17 m³) of rock examined in Raymond's Quarry. Stratigraphic levels of occurrence were recorded with each fossil for the first time. For example, the highest abundance of *Ottoia* recorded by the GSC at 72 ft (21.9 m) above Walcott's Quarry (Conway Morris 1977, p. 9) exactly corresponds to the highest abundance reported in this study (= RQ 10.3 m). This provides a potentially valuable datum, especially since different authors have adopted different scales of stratigraphic measurement for the same rocks (e.g., Conway Morris 1977, Fletcher and Collins 1998, and this work).

No further excavations were conducted in Raymond's Quarry until August of 1990. In that season, the Royal Ontario Museum field party, led by Desmond H. Collins,

sampled strata from the floor of the quarry. Encouraged by the quality of the fossils, and the possibility of discovering new taxa, more extensive excavations were conducted in the summers of 1991-- 1993. The analysis of the Raymond Quarry fauna presented here is based the fossils recovered during those collecting seasons. An approximation of the dimensions of excavated pits (Figure 3) yields a total of about 700 m³ of rock examined.

1.5 Previous work

Most literature relevant to studies of the Burgess Shale has been devoted to the descriptions and taxonomic assignment of the organisms that have been discovered there. The first soft-bodied fossil to be described from these deposits was the claw of *Anomalocaris* by Whiteaves (1892).

Following his discovery of the Phyllopod Bed in 1909, C.D. Walcott began a preliminary series of descriptions of the unique taxa, concluding with a post-humously published account (Walcott 1931). Whittington (1971a) reviewed the history of Burgess Shale research, and then undertook a major revision with the help of two of his graduate students: D.E.G. Briggs and S. Conway Morris. Other authors have contributed significantly as well, and taxonomic work remains in progress, as new organisms are still being found (D.H. Collins, pers. comm.). References to existing literature pertaining to the life habits and feeding strategies of Raymond Quarry organisms is given in Appendix III.

Only one attempt has been made to assess the community structure of Burgess Shale organisms. Conway Morris (1986) provided a detailed analysis of the 2.3 m thick Phyllopod Bed, but did so treating it as a single unit. However, it is clear that sequence of

rocks in the Phyllopod Bed records changes in community composition over time (Walcott 1912). Unfortunately, Walcott made no attempt to record stratigraphic information with his fossils. Additional information was lost when slabs, perhaps demonstrating associations between various taxa, were sawn into individual specimens. About 95 % of Walcott's material consists of disassociated parts and counterparts, and most (about 75%) are known only from unassociated parts (Conway Morris 1986).

Conway Morris (1986) had no choice but to proceed with analyses of the Phyllopod Bed 'community' without the benefit of knowing exactly how any specimens there were, how the majority of organisms occurred together in individual beds, or which specimens were transported or possibly sampled from more than one community (Devereux et al. 1998). Nonetheless, the preservation of normally taphonomically filtered-out organisms provided the best known example of Middle Cambrian ecology.

Perhaps the most significant contributions by Conway Morris (1986) in regard to Middle Cambrian life include (1) a quantified degree of taphonomic bias toward shelly remains, (2) a description of the fundamental trophic structure of metazoan life, (3) a tentative reconstruction of a trophic web, (4) the importance of carnivore/scavenger groups, and (5) the recognition of higher tiering levels than previously described (by Ausich and Bottjer 1982).

Up to the present time, no attempt has been made to resolve the palaeoecology of an *in situ* (i.e. autochthonous) Middle Cambrian community as revealed by a systematic analysis by stratigraphic occurrence as well as 'intimate' associations.

CHAPTER 2: SETTING AND TAPHONOMY

2.1 Geological setting

The Burgess Shale Formation is stratigraphically situated above limestones of the Takakkaw Tongue (formerly the "thin" Cathedral Formation, Fritz 1971), and below the Eldon Limestone Formation. The shales were deposited against the carbonate face of the Cathedral Escarpment in a basin that eventually filled with sediment (Figure 4). The Marpole Limestone Member caps the Burgess Shale, and represents carbonate platform sedimentation, which continues above the Cathedral Rim (Fletcher and Collins 1998).

The disposition of the Burgess Shale relative to the Cathedral Limestone Formation has been a subject of interest and debate. An interesting but unresolved question is why soft-bodied fossils appear to be restricted to a narrow zone in close proximity to the escarpment over a distance of more than 20 km (Collins et al. 1983). Ludvigson (1989) questioned the existence of the escarpment by offering the alternative interpretation of a vertical facies change. This suggestion was countered by Aitken and McIlreath (1990) and Fritz (1990), with whom later authors (e.g. Fletcher and Collins 1998) agree.

All trilobite zones of the Burgess Shale indicate an age of Middle Cambrian (c. 515 Ma BP). These include the uppermost *Glossopleura* Zone and the *Bathyuriscus* - *Elrathina* Zone. Fletcher and Collins (1998) recognized three additional subzones according to the occurrence of other trilobites. The *Polyleuraspis* Subzone coincides with the uppermost *Glossopleura* Zone, at the contact between the Kicking Horse Shale and Yoho River Limestone Members. The *Pagetia bootes* Subzone marks the lower

Bathyriscus - *Elrathina* Zone, and ends in the lower strata of the Raymond Quarry Shale Member. The remainder of the Burgess Shale includes the *Pagetia walcotti* Subzone, which appears to continue into the lowermost part of the Eldon Limestone Formation.

The region including Mt. Field and Mt. Stephen are part of a narrow zone that represents a major Middle Cambrian facies change between an outer detrital belt to the southwest and a middle carbonate belt to the northeast (Fritz 1971).

The Burgess Shale was moved about 160 km eastward relative to the igneous basement along a regional decollement thrust plane (Fritz 1971), and uplifted to an altitude of over 2200 m during the Mesozoic Cordilleran orogeny. Despite this, the shales and limestones adjacent to the Cathedral Escarpment remain almost horizontal, and metamorphism appears to have had a minimal effect on the quality of fossil preservation. Fritz (1971) speculated that greater tectonic deformation to the west might have destroyed the Burgess fossils if they had not been move to their present location.

2.2 Evolutionary setting of the Raymond Quarry fauna

Early metazoan evolution is poorly understood, particularly in regard to the Proterozoic - Palaeozoic transition, and whether or not there was a 'Cambrian explosion'. Unambiguous phylum-level taxonomy is not resolved in the fossil record until the Lower Cambrian, and is best exemplified by the soft-bodied Chenjiang fauna of Hunan Province, China (Hou et al. 1991). At high taxonomic ranks, the similarity between the Chinese fossils and those of the Burgess Shale points to a degree of evolutionary quiescence between the Lower and Middle Cambrian. The temporal position of the

Raymond Quarry fauna (i.e. within the Burgess Shale) is therefore well suited to the study of biodiversity and ecology of deeper water Cambrian metazoans.

The ecology of the Raymond Quarry fauna must also be taken in the context of the specific environmental setting, including sediment deposition. The changes in faunal composition that are recorded (Chapter 4) do not appear to have been the result of organismic evolution during the time period represented, nor predominantly a taphonomic artifact (Section 2.4). Rather, the Raymond Quarry sediments seem to reflect the changing physical attributes of the living environment throughout its depositional history.

2.3 Palaeoenvironmental setting

Palaeo-continental reconstructions of the Middle Cambrian place the Burgess Shale environment at about 15° north (Conway Morris 1986). A tropical latitude is therefore inferred for the Raymond Quarry deposits.

The water depth during Burgess Shale sediment accumulation has been estimated at about 100 m (e.g., Conway Morris 1998), but it may have been somewhat less for the Raymond Quarry sediment as the basin filled with mud. The presence of algae in the fauna (*Margelia* and *Marpolia*-like forms) may indicate a situation within the photic zone, but they are a minor component and autochthony of those specimens is not presently demonstrated.

Ambient water temperature and oxygenation were satisfactory to support a wide variety of benthic and pelagic organisms most of the time. The Burgess Shale was situated at the continental margin, facing the open ocean (McIlreath 1977), so there were

no significant barriers to animal migration or oceanic circulation. Occasional fluctuations in temperature and oxygenation due to upwelling of deeper water may have stunned or killed many organisms prior to their burial (Conway Morris 1986).

Below the sediment surface, the presence of pyrite indicates conditions that were anoxic and rich in hydrogen sulphide. This appears to have severely limited the diversity of infaunal organisms, and so far only priapulids are known to have burrowed Raymond Quarry sediments. Sediment oxygenation, indicated by burrows, was rare in the earliest stages of the Raymond Quarry environment, but more common and possibly more diverse in later stages (i.e., the upper strata of the member).

2.4 Taphonomy

2.4.1 *General comments*

The fossilization potential of a whole living community is dependent on a large number of factors working in concert. Information is usually lost to biological agents of organic recycling (e.g., predation, scavenging and decay) and non-biological mechanical and chemical processes (e.g., transport, fragmentation, diagenesis, metamorphism and weathering). Only in exceptional circumstances are soft (i.e., non-biomineralized) tissues preserved, given the strong dependence of carbon transfer through any given trophic web. Mineralized integuments offer little in the way of potential nutrition, as do relatively inert organic substances, such as arthropod cuticle. This property may spare some exoskeletal materials, particularly moulted fragments, from biodegradation by metazoans. However,

it appears that that all naturally occurring organic compounds are subject to eventual decay, mostly conducted by heterotrophic microbes (Butterfield 1990).

The resulting fossil record is usually highly biased in favour of shelly taxa. The best-documented exception to this is the Walcott Quarry Phyllopod Bed. Conway Morris (1986) found that up to 98 % of individual organisms and 86 % of genera in the Burgess Shale were soft-bodied and therefore had minimum potential for preservation. Obviously, some process(es) intervened, allowing even taphonomically delicate tissues to be preserved.

The degree of preservation, or amount of taphonomic filtering, is not even throughout the Burgess Shale. For example, C. D. Walcott's Phyllopod Bed is best known for the preservation of detailed anatomy of organismic tissues, but this is limited to very specific beds within the quarry. Between these beds, calcareous and silty sediments occur (Fletcher and Collins 1998) that contain only mineralized bioclasts, indicating that taphonomic circumstances often did not favour soft-bodied preservation.

Even the lateral extent of the highest quality of preservation, relative to the Cathedral Escarpment, is not always continuous. For example, the 'Great *Marrella* Layer' (Walcott 1912) thins toward the Escarpment (Fletcher and Collins 1998), becoming silty and unfossiliferous in the north end of the quarry. Throughout the exposures of the Burgess Shale on Fossil Ridge, soft-bodied fossils are infrequent within about 23 m of the vertical contact with the Cathedral Formation, as well as distances greater than about 100 m. Whether this reflects the original distribution of organisms in the living community or some kind of taphonomic artifact has not yet been determined. Soft-bodied preservation seems to be limited by proximity to the Cathedral Escarpment along

its entire length of exposure (Collins et al. 1983), which might favour some taphonomic explanation.

Although there is good evidence for Raymond Quarry faunal autochthony among many organisms (see below), others show some evidence of displacement. This suggests that organisms (particularly free-living forms) were subject to some degree of transport. Allison (1986) found that soft-bodied organisms can show considerable resistance to fragmentation during transport, implying that completeness alone is not a reliable indication of autochthony. The degree of transport must therefore be assessed using additional evidence.

2.4.2 *Autochthony of the Raymond Quarry fauna*

Some fossils in the Raymond Quarry Member reveal an apparent paradox: for example, the presumably infaunal *Ottoia* (Conway Morris 1977) is most commonly found in groups exposed on bedding planes. Apparently, they had abandoned (or were forced from) their shallow horizontal burrows (Chapter 3) prior to their burial on the sediment surface. As this is contradictory to their proposed normal life position (e.g., Gould 1989) except perhaps as a defensive response to environmental adversity, some degree of transportation prior to burial cannot be ruled out. However, there is also evidence that any such displacement was minimal (i.e., a few metres or less), and even non-existent in some cases. For example, *Ottoia* residing in its feeding burrow (Chapter 3) must be considered autochthonous, as the burrow itself could not have survived any transport. Most of the burrows may have been scoured away during obrution, thus leaving little evidence of original bioturbation in the uppermost sediment layers.

Additionally, the identification of tube-like moulting chambers built by *Ottoia* (Chapter 3) demonstrates the co-occurrence of an animal with fossil evidence of its behavior, preserved as separate (but contemporaneous) specimens. The co-occurrence itself is unremarkable, but the chambers themselves appear to have been open on at least one end (to allow the animal to exit following ecdysis); cuticular remnants preserved inside show that the whole structure could not have been moved over any significant distance. An open-ended tube would have expelled its contents if exposed to turbulence.

Evidence for lack of appreciable transport is also demonstrated by specimens of *Sidneyia* (e.g., Figure 5) which appear to be whole animals (with gut contents) buried next to obvious moults (lacking any gut trace, and showing some separation of sclerites) of approximately the same size. If the moulted exoskeleton belonged to the whole individual, then their co-occurrence within a few centimetres of each other is strong evidence for in situ obrution. Even if the fossils represent separate animals, the completeness of the moults (and more than 100 others collected; see Appendix IV) is significant. Freshly killed arthropods are more likely to remain articulated when transported than their moulted exoskeletons (c.f. Allison 1986), owing to the amount of connective tissue present. The presence of articulated moult remains implies at least a parautochthonous condition for The Raymond Quarry faunal assemblage.

There is unambiguous evidence of basal attachment structures for a number of sessile benthic forms in the Raymond Quarry fauna, including chancelloriids (Collins 1996a), *Echmatocrinus* (Sprinkle and Collins 1998), *Mackenzia* (Figure 6), and *Vauxia* (Figure 7). Conway Morris (1986) invoked the lack of such structures as strong evidence of a transported community, but the degree to which their presence or absence reflects

autochthony is not known. However, it is unlikely that the cnidarian *Mackenzia* would remain attached to clumps of sediment or brachiopods over great distances of transport. The same may be said for specimens of *Micromitra* attached to *Tubulella* (Figure 8). Perhaps the most compelling fossil evidence of in situ burial are clusters of cancelloriids attached to shelly substrates and sediment clumps. Collins (1996a) interpreted these as colonies that were buried in place and laid down parallel to bedding by obruding sediment. The best examples are generally restricted to the lower beds of the Raymond Quarry (between RQ 8.0 and 9.0 m) and close to the Cathedral Escarpment (within about 30 m), coinciding with the stratigraphic levels of highest abundance for this taxon. Obruding sediment was probably slower moving close to the escarpment (due to frictional inhibitance), and lacked sufficient force to tear cancelloriids from their holdfasts. The unattached but complete fossils occurring elsewhere seem to demonstrate some degree of fragility of the basal attachment point. Accordingly, these should be considered parautochthonous. The presence of basal attachment structures are taken here to represent additional evidence that the Raymond Quarry fauna were buried where they lived, or very close by.

In the context of an apparently autochthonous Raymond Quarry community, pre- or post-slide environmental settings need not be addressed.

2.4.3 *The physical relationship between Raymond Quarry sediments and fossils*

There are significant differences between the depositional modes of Walcott's Phyllopod Bed and the Raymond Quarry Member. Phyllopod Bed soft-bodied fossils usually occur within specific beds in a variety of random orientations, indicating that both

sediment and potential fossils were carried and eventually deposited together (Whittington 1971a). This scenario requires the consideration of a pre- and post-slide environment (Conway Morris 1986). The original location of the pre-slide environment, where the Phyllopod Bed organisms presumably lived, remains speculative. The possibility that organisms were sampled from more than one locality (Devereux et al. 1998) also raises uncertainty regarding the ecological 'purity' of those assemblages. In contrast, the Raymond Quarry fossils do not occur *within* beds, but *between* them on bedding planes (Collins 1996a). There are few recognizable fossils found within individual beds throughout the Raymond Quarry. These observations are significant because they demonstrate that organisms were already present on the sediment surface when new mudflows arrived.

The fossils in the Raymond Quarry Member appear to have no preferred compass orientation, but are often clumped together in groups (especially *Choia* and *Ottoia*). Overlapping of individuals is common in large groups, suggesting that currents directed their positions; the lack of preferred compass orientation, however, indicates that the currents were not predominately linear, but localized in their effect. Since none of the animals were preserved at steep angles to the sedimentary horizon, only dorso-ventral, lateral, and lateral-oblique compressions are present.

Truly pelagic organisms account for about 7 % of the fossils in the Raymond Quarry fauna (Table 3), and other taxa probably had at least some nektobenthic capability. A benthic feeding habit is recognized here for some organisms (e.g., undescribed medusoids) or inferred in some others (e.g., anomalocarids). Such a habit may help to explain their presence on the sediment surface at the time of burial.

Additionally, events such as anoxic upwelling, sudden changes in temperature or hydrogen sulphide contamination of the water (Conway Morris 1986, Allison and Brett 1995) may have stunned or killed other pelagic animals, which then sank to the bottom as potential fossils. The lack of any sedimentary escape structures may be considered strong evidence that the benthic fauna was also stunned or killed prior to burial.

Many of the Raymond Quarry fossils show evidence of preliminary decay, but there are no obvious signs of scavenging activity (e.g., some large articulated dinocarids are essentially complete, but appear to have been falling apart). A significant portion of the lower water column may have become inhospitable or even poisonous to macrofauna, but initial decomposition does not appear to have been affected. It is likely that autolysis and heterotrophic microbial organisms began the decay process, but did not finish it.

2.4.4 Preservational spectrum: completeness of the picture

The degree to which any fossil assemblage resembles the original community is dependent on taphonomic filtering effects. Several kinds of fossil preservation are evident within Raymond Quarry sediments, demonstrating that taphonomic conditions changed, perhaps frequently, throughout its depositional history. The range spans from fragmented shelly bioclast accumulations (representing a high degree of information loss), through soft tissue preservation that very selectively appears to have retained sub-cellular structural details (see next section).

Soft-bodied preservation is evident throughout the Raymond Quarry Member, although it is generally restricted to sediments deposited within about 100 m of the Cathedral Escarpment. The quality of soft-bodied preservation also fluctuates

significantly (where it occurs), as demonstrated by a range from ephemeral outlines to detailed unambiguous anatomical detail, even between different specimens of the same taxon. Poorly preserved remains are the most likely fossils to be lost due to metamorphic processes and any subsequent effects caused by weathering (Butterfield 1995).

Soft tissues are conspicuously absent where localized burrows and shell hash accumulations occur (Allison and Brett 1995). This indicates that living organisms were present, but taphonomic conditions prevented the preservation of their soft anatomy. The identity of the burrowing organisms remains unknown. The morphology and size of the burrows indicate that *Ottoia* did not produce them.

Areas of bedding planes devoid of fossils occur even through the most productive intervals of the Raymond Quarry, and within 100 m of the Cathedral Escarpment contact. Whether this reflects a true absence of organisms, or the taphonomic conditions necessary to preserve them, is not obvious. The latter suggestion may be considered less likely, given the broad lateral extent of soft-bodied preservation, and the comparatively small areas producing few fossils.

In short, the degree to which the Raymond Quarry fossil assemblage resembles the living community is presumably high, but the amount of information loss is not directly quantifiable.

2.4.5 Categories of soft tissue preservation in the Raymond Quarry

Two very different preservational modes seem to have been responsible for the conservation of non-biomineralized tissues of organisms in the Raymond Quarry sediments. The dominant mode is unquestionably 'Burgess Shale-type' (c.f. Butterfield

1990, 1995), represented by originally carbonaceous films or impressions. Chitinous tissues, such as arthropod or priapulid cuticle, are the most likely to be preserved this way. However, exceptional circumstances are required to prevent the loss of more delicate tissues, such as cnidarian and ctenophore epidermis. Arthropods and priapulids are abundantly preserved in some Raymond Quarry beds, along with medusoid and actinarian cnidarian body fossils, and ctenophores. The extraordinary level of preservation expressed by the latter organisms indicates that the taphonomic filter for these macrofossils was essentially non-existent, at least some of the time. The fossil assemblage best reflected the character of the living community when these conditions prevailed. Even so, Butterfield (1990) suggested that non-cuticular acoelomate organisms could still be lost to taphonomic effects, since the preserving sediments would have been unable to penetrate the body. Such animals are indeed unknown from the Raymond Quarry, but whether this is a taphonomic effect or a reflection of true absence from the original fauna is not known.

A second type of soft tissue preservation has been identified in the mid-gut region of a variety of predatory/carnivorous animals, composed of early diagenetic calcium phosphate (Bruton and Whittington 1983, Butterfield, in press). These structures are in high relief, so crystalline growth must have occurred before significant compaction occurred. Butterfield (in press) examined thin sections of the phosphatic mid-gut growths in *Leandroia superlata* and found microscopic (2 -- 3 μm) spherical structures embedded within distinct lamellae. The small size of the spheres suggests that they represent sub-cellular structures (possibly enzyme granules or lipid storage vesicles?). Although tissue and sub-cellular grade preservation seem to be present in Raymond

Quarry fossils, cellular details appear to have been obliterated. The relative reactivity of certain cell contents compared to their enclosing membranes may explain this evident paradox: they appear to have provided a focal point for early diagenetic permineralization. Since concentrations of calcium phosphate are restricted to the mid-gut, an internal source (i.e., phosphate-rich partially digested food) is most likely. The presence or absence of food in the gut at the time of burial may have affected a sensitive taphonomic balance, resulting in about equal numbers of *Leandroilia superlata* with this kind of preservation (450) and without (547).

CHAPTER 3: AUTECOLOGY OF THE 'TROPHIC NUCLEUS'

3.1 Introduction

The trophic nucleus is a concept that may be defined as the group of organisms which, taken together, comprise at least 80 % of a fauna's biomass (Neyman 1967). This idea was modified by Conway Morris (1986), who substituted estimates of biovolume and compared his results against a more 'traditional' palaeontological method using total numbers of individuals. Several taxa studied by Conway Morris (1986) occurred in large numbers, but were relatively small, and as a result they were excluded from his equivalent of the biovolumetric trophic nucleus. However, estimates of biovolume cannot take into account many of the important differences between taxa, including open spaces (e.g. poriferans), high water content (e.g. cnidarians), inert tissue (shelly taxa, e.g. trilobites, brachiopods, hyolithids) and incomparable types of metabolisms (e.g. heterotrophs and autotrophs). In each case there is the potential for interpretive flaws, but these may be corrected somewhat in the case of the individual counts by noting size, volume, water content and non-metabolizing tissues where it may be deemed appropriate. Thus, preferential treatment is given toward numerical abundance in this study; the degree of concordance with biovolumetric estimates is provided in Chapter 4, by trophic categories.

Because of the large number of taxa that occur in the Raymond Quarry Fauna (at least 77), only those that occur in sufficient numbers (as individuals or groups) to be considered a part of the trophic nucleus are given separate discussion in terms of autecology. They are treated in descending rank-order below.

The trophic nucleus of the whole Raymond Quarry fauna consists of organisms considered individually or in groups (as outlined above) that together comprise at least 1 % of the time-averaged fauna, based on the numbers of individuals deemed alive (i.e., part of the original interactive community) prior to burial. Thus defined, this includes about 88 % of the individuals representing the time-averaged standing crop that was preserved at this site. Several other taxa that are excluded on this basis, but clearly provide important clues to understanding the synecology of the Raymond Quarry Fauna, are discussed briefly in the next chapter.

3.2 General notes on *Ottoia* and other Priapulida

Living priapulids are a minor phylum of infaunal vermiform animals represented by only 18 known species (Shirley and Storch 1999). Perhaps seven genera of fossil priapulids are known from the Burgess Shale (Conway Morris 1977), and all appear to be monospecific. Of these, *Ottoia prolifica* is by far the most commonly encountered in both the Walcott and Raymond Quarry Members. Other genera in the Raymond Quarry fauna include *Louisella*, *Scolecofurca* and the tubicolous form *Selkirkia*. *Louisella* is represented by only a single specimen, and its occurrence may be considered anomalous, or at least extremely rare. *Scolecofurca*, a likely priapulid (Conway Morris 1977), is also known from only one specimen but none were found in this investigation. *Selkirkia* tubes were identified, but these lack any trace of soft tissue; this genus is therefore not considered to be part of the living fauna.

Although physical differences between extant and fossil priapulids are known (Wills 1998), broad comparisons including direct homologies are possible. The

Raymond Quarry fossils reveal some differences of major importance, as well as similarities that presumably reflect a certain degree of anatomical and behavioral evolutionary conservatism.

All priapulids share a similar body plan. A spinose extendable proboscis (= "introvert" of van der Land 1970, and others) is present at the anterior end, and bears the mouth. The base of the proboscis is often expanded, and may also bear spines (scalids). Behind the base of the proboscis lies the trunk, which, even in a contracted condition, typically accounts for the bulk of the animal's length. The trunk is conspicuously annulated and appears superficially segmented, but internal divisions (septa) are absent (e.g. van der Land 1970). Scalids and/or setae may be present along the length of the body; these are enlarged in the form of hooks at the posterior end in some species. The anus is posterolateral or posteroventral in post-Cambrian taxa, and terminal in all known Cambrian examples (Wills 1998).

Both fossil and extant priapulids cover a considerable size range, but few exceed 20 cm in length. However, truly meiofaunal examples, which account for about half of the living forms discovered so far (Shirley and Storch 1999) are not yet known from the fossil record.

3.2.1 *Abundance and distribution of Ottoia*

Ottoia prolifica is the most common fossil priapulid known, occurring in a broad geographic range through much of the Middle Cambrian (Conway Morris and Robison 1986). The animal is also the most common macrobenthic element of the Raymond

Quarry fauna; a total of 1584 specimens were recovered in this study, accounting for about 20.3 % of the fauna.

Body fossils of *Ottoia* are extremely abundant on some bedding planes in the Raymond Quarry, particularly between RQ 8.3 and 11.5 m, with a conspicuous maximum noted at 10.3 m (Figure 9). Significantly, this maximum corresponds exactly with that reported for the collection by the Geological Survey of Canada (Conway Morris 1977, Text-Fig. 4, p.9). Generally speaking, fossils of all organisms were found to be sparse through the interval between RQ 11.5 and 13.0 m. This is particularly reflected by the infrequency of *Ottoia* body fossils recovered from these beds. Some taphonomically 'delicate' animals (e.g., cnidarians) are present in these beds, perhaps indicating a favourable taphonomy for preservation, but an unfavourable living environment for the priapulids. A general decline in taphonomic quality (i.e., increasing loss of information; see Chapter 2) would presumably have a more cosmopolitan effect on a variety of taxa.

Though several specimens were excavated from above the RQ 13.0 m level, it appears that the ecological conditions most favouring *Ottoia* proliferation had shifted elsewhere permanently.

Slabs containing numerous individuals are mostly encountered at a distance from the Cathedral Escarpment of about 50 – 80 m, although patchy exceptions occurred as close as 30 m, and as far away as 100 m (Figure 10). Hundreds of individuals of *Ottoia* sometimes occur on single bedding surfaces in irregular to roundish patches. These are not interpreted as the preserved living condition, but such concentrations do suggest an original gregarious habit when conditions were favourable.

3.2.2 *Life habits of Ottoia*

In overall form, *Ottoia* is very well adapted to a burrowing existence (Conway Morris 1977). The act of burrowing itself was probably accomplished in the same manner as other soft-bodied invertebrates: probing forward, anchoring, followed by contraction of the body (see Conway Morris 1977, Text-Fig. 15, p.28 for an example of vertical burrowing; the method is identical for horizontal movement). Fossilized burrowing structures are essentially absent in the Phyllopod Bed (Piper 1972; Conway Morris 1986), and rare throughout the remainder of the Burgess Shale, with minor exceptions on some bedding planes (Rudkin 1992; Allison and Briggs 1995). *Planolites*-like burrows containing small bits of shelly debris were reported by Rudkin (1992), occurring to the south of the main Burgess Shale excavations, within the Raymond Quarry Member, at distances generally exceeding 100 m from the Cathedral Escarpment. Rudkin (1992) postulated that they might have originated from the burrowing activities of *Ottoia*. In support of this idea, one specimen was cited with "a poorly preserved but recognizable body fossil of *Ottoia* within the outline [of the burrow]." Additional specimens (e.g., Figure 11) provide an unambiguous indication that *Ottoia* burrowed through the sediment horizontally. The characteristic curvature of the trunk of *Ottoia* (e.g., Conway Morris 1977) probably reflects their bodily response to sudden environmental adversity. The following burial may have occurred before the animals were actually killed, since the natural position of modern priapulids in death is to lie fully outstretched (Lang 1948).

Ottoia burrows do not occur across bedding planes, so the animal apparently moved only through the uppermost water-saturated layer of sediment. The presence of

skeletal debris is interpreted as the expelled remains of shelly organisms ingested by *Ottoia*. The horizontal orientation of the feeding burrows challenges the U-shaped burrow invoked by several authors (e.g., Gould 1989; Briggs et al. 1994; Conway Morris 1998). Compressed, vertically oriented U-shaped burrows from the Raymond Quarry Member were reported by Allison and Briggs (1995, see their Fig. 4A, p.1081); these occurred on bedding horizons lacking soft-bodied fossils, so the trace-maker remains unidentified. The uniformly small (< 10 mm) diameter of these burrows is inconsistent with the relatively greater breadth of a typical *Ottoia* body, indicating that the trace maker was likely to have been some other animal.

The infrequency of preserved feeding burrows in the living environment of *Ottoia* is problematic, but may be partially explained by the scouring action of obtruding sediments and/or sudden changes in oxygenation. In modern communities, infaunal organisms respond to moderate or severe hypoxia by leaving their position in the sediment and lying exposed on the surface (Nilsson and Rosenberg 1994).

The mode of life of *Ottoia* appears to be unique in the Raymond Quarry fauna, particularly in regard to its predominantly infaunal habitat. The presence of a wide variety of epibenthic and nektonic organisms clearly indicates that oxygen levels in the water were adequate for metabolically energetic life forms to flourish. However, the lack of burrows across bedding planes and abundant preservation of soft tissues both point to a less hospitable environment below the sediment-water interface. Conditions of low oxygen and hydrogen sulphide accumulation in priapulid-populated sediment are more severe than in freely circulating bottom water and last for longer periods of time, with the result that most other infaunal residents are excluded (Pihl et al. 1992). Many modern

priapulids are known for their extraordinary tolerance for these conditions, and even preference for them. Their high tolerance is accomplished by lowering their metabolic rates (Oeschger 1990; Oeschger and Storey 1990; Oeschger et al. 1992), along with an ability to convert poisonous environmental sulphides to non-toxic thiosulphate (Oeschger and Vetter 1992), and the possession of a buffering mucus coat produced by mutualistic bacteria (Oeschger and Janssen 1991).

Fossil evidence is lacking for the mechanisms involved that allowed *Ottoia* to thrive in an environment that was apparently poisonous to other organisms. However, it is significant that modern priapulids often prosper where other organisms do not. This ability likely played an important role in the survival of the phylum, as they were environmentally marginalized by an expanding vagrant infauna (e.g., polychaetes) in post-Cambrian times (Bottjer and Ausich 1986). Some other soft-bodied Cambrian faunas are comparatively lacking in priapulid fossils, possibly because of their different original substrate conditions, particularly in regard to oxygen content (Conway Morris 1977), and to a lesser degree, hydrogen sulphide accumulation. A major exception is the Chenjiang fauna, which may provide a valuable comparison in some later work.

All priapulids possess a bilayered external cuticle of chitinoproteinaceous composition secreted by the cellular epidermis. Though flexible, the cuticle does not expand significantly, and so growth is accomplished through a series of moults. Prior to ecdysis, new layers of cuticle are produced (Shapeero 1962), while a limited absorption of the old cuticle takes place (Storch et al. 1989). Examination of the abandoned cuticle of extant *Priapulid* (see Lang 1948, Pl. II, Fig. 4) reveals that the anterior portion of the proboscis separates from the body, producing an opening through which the animal is

liberated. The ectoderm of the rectum and urogenital system are often forced out before the animal has completely shed the outer cuticle, in which case they are left behind inside the moult remains (Lang 1948).

Thirty-five specimens of an 'organic-walled tube' were identified (see Figure 12, for example), 24 of which (about 69 %) appear to contain within them 'indeterminate worms' and unidentified polychaetes – in some cases apparently attached to each other. The tubes are restricted to the stratigraphic interval RQ 8.0 -- 10.9 m, with a maximum abundance at RQ 8.4 m (11 specimens).

The initial interpretation of polychaetes within the tubes was based on their appearance: thin strings, ostensibly an annelid body, with bilateral projections at regular intervals reminiscent of polychaete setae. However, fossil polychaetes from the sediments of the Raymond Quarry Member are known to be exceptionally rare (Conway Morris 1979) and examples outside of tubes were found to be very rare (as well as different in form); below, an alternative interpretation is offered.

Since priapulids moult chitin (which lends itself to organic preservation, if taphonomic conditions permit), it is perhaps surprising that no fossils have yet been ascribed to the remains of this activity. Such evidence might be expected to occur in the vicinity of the animal's residence. There is a striking resemblance between the contents of the fossilized organic-walled tubes and the moult remains of modern priapulids mentioned above. Different degrees of decomposition prior to fossilization (Whittington 1971a; Conway Morris 1977), and probably some degree of resorption of cuticular material in advance of ecdysis has obscured most of the identifying characteristics of *Ottoia*. Even though most of the cuticular material is missing in these fossils, sufficient

features are resolvable to permit this identification. The polychaete-like remains within the tubes are most likely fragments of trunk cuticle; the 'setae' represent poorly preserved remnants of the annular rings, while the 'annelid' body-like strings probably represent a protective thickening of the integument along the midventral line under which the nerve cord was positioned (Conway Morris 1977). Other structures, such as the 'indeterminate worms' are consistent with the shedding of rectal/urogenital chitin, as described by Lang (1948). The organic-walled tubes appear to represent a kind of moulting chamber, even though such structures are unknown among living priapulids. The only fossilized excretions observed in direct association with unambiguous fossils of *Ottoia* other than obvious fecal matter are mucus-like and were produced at the oral region (see below). The occurrence of these putative moulting chambers is contemporaneous with fossils of *Ottoia*, but does not match maximum abundance for the taxon. Infrequency and stratigraphic restriction of occurrence of the remains would likely result from a seasonal event that required a fortuitously timed burial episode to preserve them.

3.2.3 Feeding strategy and trophic status of *Ottoia*

Some *Ottoia* show evidence of a carbon-rich substance attached to the mouth opening. Conway Morris (1977) interpreted this as part of the fully extended proboscis, but some specimens in this study suggest that the structure was in a fluid phase prior to sediment lithification. If this feature is compared with the enigmatic 'dark stain' generally associated with the posterior of many specimens of *Marrella* from Walcott's Quarry (e.g., Whittington 1971b), the only significant difference is the end of the body from which it

appears to come. Because it is associated with the mouth, a link to the feeding habits of *Ottoia* is possible, but problematic since no obvious homologue exists in modern forms.

Conway Morris (1977) reported 35 specimens of *Ottoia* preserved with identifiable gut contents, representing approximately 2 % of his available specimens. Most of the prey consisted of hyolithids, along with a few brachiopods (in some cases both together), and one putative example of cannibalism. The Raymond Quarry assemblage includes 17 examples with similar shelly gut contents, but these represent only about 1 % of the total population. In addition to these, another 38 specimens (an additional 2.4 %) presented with obvious gut matter consisting of unstructured carbonaceous masses, or apparently phosphatic granules. These represent macerated, incompletely digested soft tissues (soft-bodied prey?), some of which underwent early diagenetic mineralization. Consistent with Conway Morris' (1977) observation, the majority of specimens (here, about 97 %) lack any trace of gut contents.

No more than three hyolith tests were observed in the gut of a single *Ottoia* from the Raymond Quarry fauna, compared to a maximum of 6 observed by Conway Morris (1977) in a specimen from Walcott's Phyllopod Bed. No sediment was observed in the gut of any specimens in this study, confirming that *Ottoia* was not a deposit feeder (Conway Morris 1977).

A single specimen (ROM 92-615) that appears to represent a feeding burrow of *Ottoia* contains no remains of the worm, but a ctenophore (*Ctenorhabdotus*) instead. It seems unlikely that ctenophores (which are pelagic) would seek refuge in a burrow, and so there is circumstantial evidence that *Ottoia* actively preyed upon them. This is

particularly important because, if correctly assessed here, the animals preying upon *Ottoia* may be considered tertiary-level carnivores (Section 3.11.4).

Lang (1948) observed that some living priapulids, especially *Priapulid*, regularly consumed individuals of its own species – and size. Therefore, the single example of cannibalism reported by Conway Morris (1977) is an important observation, if it can be substantiated. However, the specimen (USNM 198922) appears to be in a relatively advanced state of decay, and may alternatively be interpreted as a single individual in the process of breaking up. There is no clearly defined gut trace in this specimen, and the proboscis "within the gut" is fully inflated, unlike the constricted rows of phosphatic granules and carbonaceous remains that presumably represent other soft-bodied prey. Moreover, the proboscis is missing from the specimen, suggesting that the one visible in the gut region has simply become detached and displaced. No other specimens of *Ottoia* have been found with identifiable portions of other *Ottoia* in their gut cavities, and therefore the evidence is inconclusive. Even if Conway Morris' (1977) interpretation is correct, the fossil represents an extremely rare event, outside of the normal behavior of *Ottoia*.

3.3 *Choia* *ridleyi* and *C. carteri* (Porifera)

3.3.1 General notes on *Choia*

Two species of the demosponge *Choia* have been described from the Burgess Shale: *C. ridleyi* and *C. carteri* (Rigby 1986). The main body (i.e., central disc) is circular to slightly elliptical, and in the species considered within the Raymond Quarry fauna, are

usually 5 – 10 mm in diameter. The central disc was a low conical structure composed of a radiating thatch of spicules (oxeas); longer and slightly thicker (coronal) spicules extended beyond the margin of the central disc up to a maximum of about 25 mm.

3.3.2 *Abundance and distribution of Choia*

The patchy nature of their occurrence and their relatively small size appears to have skewed the relative importance of *Choia* in the Raymond Quarry fauna. A total of 1434 individuals were recovered, making this genus the second most important in the fauna in terms of number of individuals (about 18.4 %).

Clustered *in situ* bedding plane distributions establish that *Choia* was locally gregarious. Walcott (1920) reported as many as 40 specimens of *C. ridleyi* occurring together on a single slab. Several slabs from this study showed similar accumulations, including one surface ($< 0.1 \text{ m}^2$) preserving over 500 individuals. In this latter case, the sponges occur on the rock surface right to the edges of the slab, and so the original *Choia* patch was likely to have consisted of even greater numbers. Importantly, fewer individuals were observed throughout the interval RQ 8.3 – 11.5 m at more or less constant numbers (Figure 13), indicating a smaller population most of the time. Only a small number of slabs were observed with a large number of *Choia* on their surface, representing a few well-populated patches or blooms (most conspicuously at RQ 8.4 and 9.3 m). These blooming events may have been short-lived, as succeeding beds typically produce fewer numbers, or sometimes none at all (Chapter 4).

Like *Vauxia*, specimens of *Choia* were scarce in close to the Cathedral Escarpment proximity (i.e., less than 33 m distant). However, the highest concentrations

(almost all of the multiple-specimen slabs) were collected at a distance of about 40 – 60 m. Ambient palaeocurrent flow was likely to have been somewhat less than that preferred by the attached sponges like *Vauxia*. This is consistent with *Choia*'s sediment-hugging life position, and may explain the respective distributions of other sponges relative to the Escarpment base as well.

3.3.3 *Life habits of Choia*

Most Cambrian sponges are reconstructed with a concave upper surface (e.g., Walcott 1920) but Rigby (1986) noted that the concave surface of *Choia* was nearly flat and was covered with slightly coarser spicules. He concluded that the most hydrodynamically stable orientation would be convex-up (see Rigby 1986, Text-Fig. 13, p.27). This would have provided an upward convergent excurrent system with water exiting the central region just a few (3 -- 5?) millimetres above the sediment. As an unattached form, Rigby (1986) found this orientation to be the most tenable.

3.3.4 *Feeding strategy and trophic status of Choia*

As is the case with most sponges, *Choia* was probably a suspension feeder, but only taking fine particulate matter from the lowest portion of the water column. This niche is comparable to that occupied by epifaunal brachiopods, except that the latter presumably fed on larger particles, such as phytoplankton. All of the specimens of *Choia* in this study appeared to be complete, and therefore are regarded as having been buried alive. Because the individual spicules are small and fine, it is possible that dissociated specimens have escaped detection, but no such fossils were observed in the laboratory,

nor have they been observed among identifiable gut contents of any Burgess Shale animal. Apparently, the spicules of *Choia* provided a sufficient deterrence to predators.

3.4 *Pollingeria grandis* (Incertae sedis)

3.4.1 General notes on *Pollingeria*

Individual *Pollingeria* in the Raymond Quarry fauna are approximately one third larger than those collected by Walcott. In overall form, they are elongate and variable in outline (Walcott 1911), often appearing somewhat leaf-like (Conway Morris 1985).

Walcott (1911) described *Pollingeria* as the scale of a large (> 12 cm long) polychaete ("Wiwaxiid"). He noted that the 'scales' occur in great numbers, with only one example known to occur that indicated the size and form of the dorsal surface of the worm, and that nothing indicated the nature of the rest of the body. Meandering dark thread-like processes preserved in minor relief occur in most specimens. Walcott (1911) speculated that these might have been caused by a small annelid seeking some kind food deposited on the scales.

Conway Morris (1985) strongly doubted Walcott's (1911) interpretation, pointing out that the one 'whole' specimen lacked anything more coherent than a broadly linear-oriented collection of individual elements, and that there was no other evidence to suggest that they represented the disaggregated remains of a sclerite-covered organism. The irregularly meandering thread-like structures are not believed to be worm trails, but instead some integral part of the organism (Conway Morris 1985), which may have occasionally become separated as a result of partial decay.

The affinities of *Pollingeria* remain unresolved. Conway Morris (1985) questioned whether they even represented animal remains. Instead, he offered an algal interpretation (i.e., flattened algal thali, with strand-like reproductive structures within), admitting that there was no close resemblance to either Burgess Shale algae (Walcott 1919) or representatives elsewhere. There is superficial resemblance to egg sacs, fecal remains, and even large protists, but present evidence is equivocal.

3.4.2 *Abundance and distribution of Pollingeria*

Whatever the affinities of this organism, they were successful in the palaeoenvironment of the Raymond Quarry fauna. A total of 1135 'individuals', representing about 14.6 % of the fauna were recovered in this study. Most appear to have been preserved as discrete units, but advanced levels of decay in others may indicate that some or all of the organisms had been dead for some time before burial.

Pollingeria is most common within the Raymond Quarry interval 8.0 -- 11.0m (Figure 14), and so can be considered an integral part of the lower Raymond Quarry fauna.

Lateral variations were noticed in the abundance of *Pollingeria* relative to the Cathedral Escarpment. The fossil was essentially non-existent in sediments within 23 m of the contact, and extremely rare in the northernmost extension of the quarry (to about 30 m distance). *Pollingeria* occurring at about 30 -- 60m are in small clumps of mostly non-overlapping individuals; the highest abundance was observed at about 60 -- 80 m where individuals are generally more discrete, but occasionally cover some bedding planes in large masses. *Pollingeria* is most underrepresented from this latter excavation,

but because decay prior to fossilization seemed most advanced here, often the meandering threads were all that remained. This zone was also highly weathered, making the degree of original decomposition difficult to assess.

3.4.3 *Life habits of Pollingeria*

Life habits of this organism can not be determined with any certainty with present evidence. A lack of any obvious swimming, walking or burrowing morphology is most consistent with a sessile or passive benthic existence. Also, the thread-like processes more than likely acted against buoyancy; they seem to have accumulated the bulk of organic compounds, which tend to be denser than seawater (unless they were lipid stores, which seems unlikely).

3.4.4 *Feeding strategy and trophic status of Pollingeria*

A feeding strategy for *Pollingeria* is likewise difficult to imagine. If Conway Morris' (1985) algal interpretation is correct, then it was a photoautotroph. It is equally possible that the dark strands represent some kind of ingested, digested, or stored food. A complete lack of predatory features in this organism may indicate a primary consumer trophic level.

There is no evidence in the form of apparent injuries or presence in the gut of another organism to suggest that *Pollingeria* was preyed upon. However, because of their apparently delicate construction, their remains would be difficult (or impossible) to identify even if they were ingested whole.

3.5 *Leancoilia superlata* and *L. persephone* (Arthropoda)

3.5.1 General notes on *Leancoilia*

Leancoilia was a medium-sized arthropod, and the fossils exhibit a considerable range in length from about 2.5 cm to over 10 cm (not including the frontal appendages when extended forward), with most specimens being about 6 cm in length.

The establishment of “*L. persephone*” by Simonetta (1970) was rejected by Bruton and Whittington (1983), based on the poor preservational quality and paucity of available material, and therefore evidence. Specimens that are identifiably consistent with Simonetta's (1970) description are included in this study, but because the taxonomic status is not yet resolved, *L. superlata* and *L. persephone* are given treated here as a single entity.

Fossils reveal that the anteriormost portion of the carapace of *Leancoilia* was usually curved upward into a snout, resembling a hook in specimens preserved in lateral aspect (Bruton and Whittington 1983). Dorsoventrally oriented specimens obscure this feature partially, although a slight point at the tip of the carapace is usually detectable. The lateral margins of the carapace are often decorated with posteriorly directed millimetre-scale serrations.

Walcott (1912) misinterpreted the attachment point of the 'great appendages' for large pedunculate eyes, and Bruton and Whittington (1983) suggested that *Leancoilia* was blind. New specimens collected in this study show that the animal did in fact possess eyes, although their size and position usually make them difficult to observe. Small reflective spots (approximately 1 mm in diameter), in a curving row just inside the

cephalic margin near the anterior are visible on a few specimens. These are interpreted as eyes based on their position and their discrete preservational characteristics (e.g. high reflectivity), common to the eyes of other Burgess Shale arthropods. The eyes are only visible in the fossils when there has been fortuitous separation of small portions of carapace between part and counterpart in the critical regions. They are always present at a lower level in the matrix than the dorsal carapace in positive counterparts, so they must have emerged from the ventral surface of the carapace in life. Perhaps significantly, the eyes appear to be more conspicuous in specimens of *L. persephone*; they were observed in most of the well preserved dorsoventrally oriented examples available (e.g. Figure 15). Hou and Bergstrom (1998) reported similar eyes for the genus *Leancoilia* (or a closely related form) in the Lower Cambrian Chenjiang fauna.

The cephalic appendages are discussed in Section 3.5.3.

The trunk of *Leancoilia* was essentially smooth, widest at the fourth segment and gently tapered toward the anterior and posterior. Two rows of short spines were present on the dorsal surface, delimiting an axial region. The trunk appendages were biramous, with conspicuously developed outer gill branches, and smaller jointed inner branches.

The body of *Leancoilia* terminates in a triangular spinose telson.

3.5.2 Abundance and distribution of *Leancoilia*

The excavations in this study produced 1079 specimens of *L. superlata* of which 997 were complete (about 12.8 % of the fauna) and showed no signs of disarticulation; these were presumably alive and were therefore part of the interactive community shortly

before they were buried. The remaining portion is composed of either moult fragments or dead individuals that subsequently became disarticulated. Additionally, 65 whole specimens of "*L. persephone*" were identified, bringing up the total of this genus to 1062 individuals, thus representing about 13.6 % of the fauna.

Leancoilia abundance patterns through the strata in this investigation show that the animal was always a significant component of the fauna from RQ 8.0 m through 11.5 m (Figure 16). This is remarkably like the temporal distribution for *Ottoia* (compare Figure 9). Perhaps significantly, specimens of *L. superlata* and *L. persephone* were never found together in close proximity (i.e., in exactly the same bedding plane on a single slab of matrix). It is therefore presumed that the two forms rarely interacted, and may have preferred slightly different environmental conditions. *L. superlata* dominates over *L. persephone* by an overall average of about 15:1 in almost all of the strata in which they are known to occur. However, an isolated band of rock about 30 cm thick, situated at about RQ 16 – 17 m and toward the southern boundary fault, has produced mostly the *L. persephone* form. This appears to have been an anomalous and very limited concentration, and may be explained by a brief shift in the ecological environment that temporarily favoured the habitat of *L. persephone*. Alternatively, taphonomic fluctuation may have been responsible, but there is no evidence to suggest that this form would be preserved when the other is not. Neither form has been documented in younger strata.

The lateral distribution of *Leancoilia* was found to be more or less even from the main pit southward (about 30 – 100 m from the Escarpment), occasionally in clumps of several individuals. Very few examples were found in the northernmost extension of the quarry.

3.5.3 *Life habits of Leanchoilia*

Of particular interest, with respect to the autecology of *Leanchoilia*, are the ‘great appendages’ which emerge from the ventral surface of the carapace and often extend beyond the margin for a length approximately equal to the remainder of the entire animal. This appendage appears in a variety of orientations, suggesting a wide range of motion in life, afforded perhaps by a proximal arthroidial membrane (Bruton and Whittington 1983). The second and third podomeres possess long dorsal extensions, each terminating in a flexible flagella. The fourth podomere is an elongated tapering shaft that terminates in a small 3-pointed claw, beyond which extends a third flagellum. The third and fourth podomeres (and possibly second and third as well) could be brought together by extending their length to form an effective clasping device (Walcott 1912). There is nothing about the anatomy of these limbs to suggest that they were used in any way to assist in walking or swimming. Rather, the combination of a clasping mechanism with short claws suggests a manipulative function, while the annulated flagella may have served to provide sensory information, in a manner analogous to antennae.

A large number of specimens show the great appendages swung back along the ventral midline; this position would have afforded the most hydrodynamically efficient position during active swimming (i.e., they were passive in this respect).

Bruton and Whittington (1983) proposed that *Leanchoilia* was a benthonic animal, based on its occurrence in the Phyllopod Bed as whole specimens. The inner branches of the trunk appendages, though not well developed, were probably of sufficient number to support the body above the sediment and move it slowly along the bottom. The

‘curtain’ formed by the lamellate lobes (gills) was adapted to provide swimming ability, and so it follows that this animal likely swam (and walked) near the sediment surface, as suggested by Bruton and Whittington (1983). The spinose telson was limited in its range of motion by the eleventh trunk segment except dorsoventrally (Bruton and Whittington 1983). The position of the telson would have therefore effectively controlled pitch while *Leancoilia* was swimming.

3.5.4 Feeding strategy and trophic status of *Leancoilia*

None of the appendages of *Leancoilia* were apparently gnathobasic (Bruton and Whittington 1983), and the great appendage, though clawed, was not suited for restraining potential prey. A predatory feeding strategy therefore seems unlikely. Butterfield (in press) noted that the structure of the alimentary canal resembled the diverticula of modern carnivorous arachnomorphs, but this adaptation in *Leancoilia* may simply reflect a diet of ‘high quality’ detritus (i.e., scavenged carcasses). The great appendages, equipped with sensory flagella, were likely used in combination with the eyes to locate organic debris lying on the sediment surface. The claws and clasping devices were suited to manipulate food items, but it is unclear how food was brought to the mouth since the appendages appear to be poorly positioned for this.

‘Gut contents’ were recorded in 450 specimens (about 42 %), but no identifiable remains were present. The alimentary canal is usually visible along the midline in dorsoventral compressions, or laterally as a gently curved linear chain of dark nodules consisting of early diagenetic phosphate (apatite) (Bruton and Whittington 1983) in high

positive relief. Butterfield (in press) has observed microscopic spheroidal bodies within these structures, and these appear to represent subcellular detail of midgut glands.

Leancoilia is observed in the gut region of one specimen of an undescribed medusoid (Section 3.11.4). If this is not the result of chance superposition, then this is direct evidence of predation. Fragmentary remains of *Leancoilia* are common throughout the lower Raymond Quarry strata; these may represent a combination of moult fragments as well as portions of incompletely consumed individuals. Other large predators of *Leancoilia* may have included *Sidneyia* (for smaller individuals) and dinocarids.

3.6 *Vauxia graciellenta* (Porifera)

3.6.1 *General notes on Vauxia*

The genus *Vauxia* was erected by Walcott (1920), and includes several species, the most common of which is *V. graciellenta*. In overall form, this sponge is composed of elongated tubes emerging from a ~ 1 mm base, widening to a maximum of about 1 cm and typically attaining 5 – 6 cm in length; unusually large specimens may exceed 15 cm, though rarely. These may occur as isolated units, or in one of two types of branched clumps.

In the Raymond Quarry fauna clumps most often branch from a common base, curve slightly toward the apex and terminate with several osculi, thus giving them a bush-like appearance. Less frequently, clumps branch at irregular intervals from a primary tube, superficially resembling a saguaro cactus. The different forms probably represent

an ecophenotypic response to environmental current flow and sediment loading, rather than genetically distinct species.

The only species of *Vauxia* identified in the Raymond Quarry fauna is *V. graciellenta*, although the possibility of confusion may exist with juvenile examples of the unbranched, relatively large form *V. bellula*. Many specimens of *Vauxia* in this fauna, as elsewhere, appear to be unbranched, but it is difficult to determine whether these represent fragments of larger groups or discrete specimens.

Vauxia was originally assigned to the hexactinellids by Walcott (1920), who interpreted the skeletal frame as a fused network of spicule rays, forming modified stauracts. Rigby (1980) could find no evidence of stauract-based hexactinellid spicules in the genus (based on a large specimen from the Spence Shale of northern Utah) and later (Rigby 1986) proposed assignment to the demosponges (order Verongida). *Vauxia* appears to have possessed a skeleton of cored fibres, as seen in modern *Verongia* (further discussion below). Although extant demosponges may possess siliceous spicules, or spongin fibres (or both), Rigby (1986) found no evidence for anything but an original spongin composition in the double-layered framework of *Vauxia*. The lack of a spicular array would be unique among Burgess Shale sponges (Briggs et al. 1994), but the three-dimensional aspect of the skeleton does suggest some original resistance to compaction.

3.6.2 Abundance and distribution of *Vauxia*

A total of 476 specimens were recovered in this study (about 6.1 % of the fauna). Determination of the number of 'individuals' for a colonial organism, or those which tend to occur in great masses, is difficult (c.f., algal slabs, Conway Morris 1986), but made

more accurate if some attempt is made to count individual tubes whenever possible (Section 1.3.7).

Vauxia is abundant throughout the lower Raymond Quarry, with maximum occurrences between RQ 8.0 and 11.0 m (Figure 17). A conspicuous peak of occurrence occurred at RQ 8.9 m, corresponding to the maximum abundance of the undescribed benthic holothurian ("Creeposaurus"). Very few specimens of *Vauxia* were recovered from bedding planes above the RQ 11.0 m level.

‘Complete’ specimens of *Vauxia* were found to be sparse near the Cathedral Escarpment, and increasingly abundant with greater distance to a maximum occurrence at about 70 – 80 m basinward. In modern marine ecosystems, the total biomass of suspension feeders decreases with reduced current velocity (Gili and Coma 1998); the distribution of *Vauxia* may have been related to palaeocurrents along the base of the Cathedral Escarpment, which would have affected the rate of continuous provision of food-laden water.

3.6.3 *Life habits of Vauxia*

Vauxia, like most other sponges, was sessile. The animal presumably lived attached to the sea floor with a holdfast embedded shallowly in the sediment.

Occasionally, they attached to a firmer substrate, such as the shell of the brachiopod *Diraphora* (Figure 7).

3.6.4 *Feeding strategy and trophic status of Vauxia*

In life, water was pumped through canals in the soft tissue of the sponge providing food and gas exchange and transporting wastes through the apical opening (osculum). Sponges feed primarily on suspended organic matter (Reiswig 1971), plus larger particles consisting mainly of bacteria. Some extant demosponges (e.g., *Verongia*) contain obligate cyanobacterial symbionts, and thus live within the photic zone. These 'bacteriosponges' have very high respiratory rates in comparison with other sponges and rely on particulate sources of energy for only 14 % of their respiration and growth requirements (Reiswig 1981). However, comparisons between *Vauxia* and *Verongia* must be limited to structural similarities, since the nature of fossils precludes a comparison of diets. It is therefore presumed that *Vauxia* had a 'normal' diet consisting primarily of fine particulate matter suspended in the water column. Whatever the rate of metabolism, the proportion of *Vauxia* within the fauna clearly indicates that this taxon was an important agent of trophic energy flux.

Fish (e.g., Chaunas and Pawlick 1996) and polychaetes (Pawlick 1983) are the major predators of sponges in modern oceans. The lack of obvious damage to sponge skeletons in the Raymond Quarry fauna suggests that predators did not attack and consume any significant amount of *Vauxia* tissue. Sponge-eating polychaetes do not generally consume skeletal parts, but rather feed directly on the soft tissues (Pawlick 1983). However, polychaetes are essentially absent (taphonomically or otherwise) from this fauna. Without any obvious predators, *Vauxia* appears to have been a kind of trophic dead end.

3.7 Chancelloriids (Porifera?/'Coeloscleritophora'?)

***Chancelloria* spp., *Allonia* sp.**

3.7.1 General notes on chancelloriids

Although the Raymond Quarry fauna contains both *Chancelloria* (evidently more than one species) and the related form *Allonia*, the overwhelming proportion consists of individuals identified as *C. eros*. All of these are considered as a single entity in this study, since (1) all appear to have been functionally identical, (2) they are represented by similar-sized individuals, and (3) the different kinds of chancelloriid are often indistinguishable from one another, especially in the case of poorly preserved, incomplete or small (juvenile?) specimens. The effect of considering *Allonia* (a comparatively rare taxon) separately would be insignificant on the scale of the whole fauna, especially since niche partitioning of such functionally similar forms would have been minimal.

Mature chancelloriids were tubular animals with a narrow base including a holdfast, a gently expanded body, and a bluntly rounded apex. Raymond Quarry specimens are typically 2 – 3 cm wide, and 8 – 10 cm in length. Exceptionally large specimens are rare, but show that the animal could exceed lengths of 20 cm. The whole body is decorated with stellate sclerites whose form and arrangement identify different taxa. The nature of these elements (i.e, their hollow and composite construction) has led to uncertainty in regard to their taxonomic affinity at the phylum level. Similarities with sponges have been pointed out (Butterfield and Nicholas 1996), but the external nature of chancelloriid sclerites remains problematic (Bengtson et al. 1996). Whatever the true affinities of the chancelloriids may have been, in the living community of the Raymond Quarry fauna they certainly functioned as sponges.

3.7.2 *Abundance and distribution of cancelloriids*

A total of 297 complete individuals (about 3.8 % of the fauna) were identified in this study. Many of these appear to have been buried *in situ* (see below), while some were apparently torn from their holdfasts. The latter may be considered parautochthonous.

The stratigraphic distribution of cancelloriids is conspicuously bimodal, with major occurrences in the lower strata of the Raymond Quarry, and a less prominent re-emergence at higher levels (Figure 18). Apparently, the environment between RQ 10.5 and 11.5 m was unfavourable for the establishment of this taxa. Independent evidence for a changing environment includes shallowing upward through the Raymond Quarry Member (e.g., Fletcher and Collins 1998), but it remains unknown to what extent this affected the environment during this single metre of deposition. Taphonomic filtering may have played a role as well, but soft-bodied preservation of other organisms in the same interval would seem to indicate that information loss was minimal.

The cancelloriids (and associated whole *Parkaspis* trilobites) are unique in the Raymond Quarry fauna for their preferred close proximity to the Cathedral Escarpment. Apparently *in situ* specimens appear to be restricted to distances between 30 -- 35 m from the Escarpment base, but no complete cancelloriids were found closer than 23 m.

3.7.3 *Life habits of cancelloriids*

Comparisons of the life habits between cancelloriids and *Vauxia* may be made, in that both lived anchored shallowly in the mud, or attached to a more rigid substrate.

Chancelloriids, however, seem to have preferred the latter, when available. Whole slabs of multiple individuals are found with basally attached mud clots, coarser sediment and fragmentary shelly remains of trilobites (unidentified ptychopariids, *Olenoides* and *Parkaspis*) in some lower Raymond Quarry strata (Chapter 2).

Chancelloriids occur in a wide range of size in the Raymond Quarry fauna, providing some opportunity to observe some details of ontogenetic development. The smallest animals (< 5 mm) were ball-like bundles of overlapping sclerites that obscure most of their individual form, and especially the soft tissues. These small examples have not been observed attached to anything, and so chancelloriids may have been free-living (and passively transported along the sea bottom) for a short period before settling onto a suitable substrate. Alternatively, they may have all been detached in the process of burial.

Growth of the organism was achieved by the generation of new body wall tissue and new sclerites added in the apical region (Bengtson et al. 1996). Where some specimens afford an oblique view of the apex, a tight cluster of sclerites is always present, but it is not clear whether there was a discrete opening (analogous or homologous to a genuine poriferan osculum).

3.7.4 Feeding strategy and trophic status of chancelloriids

Chancelloriids possessed a “robust punctate integument” (Butterfield and Nicholas 1996) through which currents of water passed for feeding and respiration. An external cuticle is all but unknown in extant sponges; one of the few exceptions is *Verongia* (N.J. Butterfield, pers. comm.). It is therefore conceivable that chancelloriids

competed for some of the same suspended particulate food as other contemporaneous sponges.

Sclerites along the mid-body are uniformly distributed, and may be dense (overlapping) to sparse (i.e., much more soft tissue exposed between individual elements), and exhibit some variety in form. If the sclerites were truly external, as they appear to have been (Goryansky 1973; Bengtson and Missarzhevsky 1981), then some species were more heavily armoured than others. The vast majority of specimens in this fauna were densely covered (c.f. *C. eros*), suggesting fairly heavy predation pressure. As a defensive measure, the sclerites appear to have been effective, since no specimens show evidence of predation and no sclerites have been noted among gut contents of other animals.

3.8 *Sidneyia inexpectans* (Arthropoda)

3.8.1 *General notes on Sidneyia*

Sidneyia was a large arachnomorph arthropod (Briggs et al. 1994): the fossils exhibit a wide range of size (from about 4 cm to over 20 cm in length). Most complete individuals were about 15 cm in length. Bruton (1981) gave a comprehensive description of this taxon.

The original biconvexity of the cephalon is occasionally revealed in specimens that are preserved in a head-on orientation. The posterolateral margins of the carapace shield were notched to accommodate the emergence of antennae and eyes. The most common attitude of the antennae in the fossils (= natural position in life?) is a gentle

curve laterally and forward of the head, but a variety of other orientations suggests that they had considerable flexibility. This was afforded by at least twenty articulating segments; those proximal bore setae, but distal segments apparently did not.

The light collecting surface of each eye was hemispherical, and by virtue of a peduncle (see Bruton, 1981, Fig.44, pl. 6), could have been oriented in a variety of positions to provide a considerable visual field above, below and lateral to the animal.

The thorax of *Sidneyia* can be divided into two parts based on the nature of the ventral appendages (Bruton 1981). Appendages of the anterior segments (1 – 4) apparently possessed no functional gills, but were equipped with greatly enlarged coxae. The posterior thoracic appendages (5 – 9) were gill-bearing and also gnathobasic, though comparatively less robust.

The telson of *Sidneyia* is composed of several terminal sclerites that together form a flattened fan-like process directed laterally.

3.8.2 *Abundance and distribution of Sidneyia*

A total of 204 specimens of *Sidneyia* were deemed complete enough to represent animals that were alive shortly before burial (about 2.7 % of the Raymond Quarry fauna).

Sidneyia was found to occupy a comparable stratigraphic distribution (Figure 19) with *Ottoia*, *Leandroia* and *Vauxia* (compare with Figures 9, 16 and 17 respectively), indicating that it was always a significant component of the Raymond Quarry fauna.

The lateral distribution of *Sidneyia* was remarkably even throughout the excavation, even in the northernmost extension. No complete specimens were found at distances greater than 100 m from the Cathedral Escarpment.

3.8.3 *Life habits of Sidneyia*

Movement of the gills (and thus aeration) would have been limited during walking by the close proximity of posterior thoracic appendages, but they were considerably less confined if *Sidneyia* swam. Bruton (1981) considered *Sidneyia* to be primarily benthic, but noted that the caudal fan appeared to be an adaptation to swimming. The fossils from Raymond Quarry Member seem to confirm Bruton's (1981) suggestion that the abdomen was fairly rigid, and active swimming was therefore limited to short distances over the sediment (i.e., *Sidneyia* was nektobenthic).

Incomplete specimens are relatively abundant, accounting for about 41 % (144 of 348 total *Sidneyia* fossils). Many of these lack appendages and caudal fans, and present no evidence of a gut trace and they are presumed to be the preserved remains of exuviae. In several specimens, a whole animal (often with gut contents) was found immediately next to an obvious moult of approximately the same size (e.g. Figure 5), and some of these may represent the fortuitous preservation of a freshly moulted animal next to its recently cast off exoskeleton.

3.8.4 *Feeding strategy and trophic status of Sidneyia*

No evidence has been found for the mouth of *Sidneyia*, despite Bruton's (1981) attempts to locate it by dissection through the carapace. This suggests that the oral opening lacked significantly sclerotized parts, and that food items were swallowed whole (if they were small enough), or reduced by the action of other appendages.

The well-developed spines of the coxae formed a conspicuous gnathobase that was directed along the ventral midline of the anterior trunk segments. The tips of these spines are well defined and often highly reflective, indicating a higher degree of original sclerotization (Bruton 1981). Additional spines were located on the ventral surface of each successive podomere, and would have also been directed toward the midline by prehensile flexure of the whole appendage. Each of the anterior trunk appendages would have therefore been an effective cutting, grinding and shredding device for food as it was passed forward to the mouth.

Gut contents of *Sidneyia* confirm that it was a predator of ptychopariid trilobites, hyolithids and bradoriids, and possibly agnostids (Bruton, 1981). An additional specimen (from excavations below Walcott's Quarry; D. H. Collins, pers. comm.) contains disarticulated ptychopariid fragments, eodiscids (*Pagetia* sp.) as well as inarticulate brachiopod valves within the posterior gut cavity. All of these taxa were coeval in the Raymond Quarry fauna, and so these specimens are taken to accurately represent the shelly diet of *Sidneyia*. However, identifiable gut contents were observed infrequently. Most gut contents seen in the fossils consisted of unidentifiable organic masses with apatite and occasional pyrite, suggesting a primarily 'soft' diet. It is considered probable that all of the biomineralized taxa mentioned above were ingested as food, except possibly the agnostids. Agnostids have been observed apparently seeking refuge or scavenging within discarded tubes of the priapulid *Selkirkia* (pers. obs.); this kind of behavior is more likely to have resulted in Bruton's (1981) observation of agnostids below the carapace of *Sidneyia*, rather than if the animal had ingested agnostids as food. Bruton (1981) presumed that the high percentage of phosphatic minerals (i.e., apatite) in

the posterior gut was derived from ingested shell-bearing organisms, but an early diagenetic origin, similar to that which is observed in many specimens of *Leancoilia*, seems more likely (Whittington and Briggs 1985; Butterfield, in press).

Prey were likely obtained on the seafloor, and the envelopment of the head by a pronounced doublure suggests an ability to burrow as well (Bruton, 1981). Burrowing structures that may be ascribed to the activities of *Sidneyia* are, however, lacking in the Raymond sediments. If burrowing was a normal behavior of this animal, then it did so elsewhere. Since *Ottoia* is the only infaunal resident identified in this fauna thus far, it may be provisionally concluded that priapulids were not part of the normal diet of *Sidneyia*. An exception may be made in the case of priapulids that had abandoned or been forced from their burrows, and lay exposed on the surface of the mud (Section 3.2.2).

There is no evidence that *Sidneyia* was the preferred prey of other predators. Incomplete specimens and individual sclerites all appear to have been discarded moult fragments.

3.9 *Priscansermarinus barnetti* (Arthropoda, Cirripedia?)

3.9.1 General notes on *Priscansermarinus*

Collins and Rudkin (1981) described *Priscansermarinus* from a single talus slab containing two clusters totaling 62 individuals. The animals were small, measuring 31 mm in length or less. The additional specimens recovered in this study are consistent

with this size range, suggesting that this was a normal size for the animal in the Raymond Quarry fauna.

The fossils reveal a simple body plan, consisting of a bulbous body and robust stalk with an attachment base. A mass of reflective, occasionally pyritized material is observed on the body portion (Figure 20), and has been interpreted as the remnants of possibly chitinous plate-like body coverings (Collins and Rudkin 1981). Occasionally, sub-millimetric parallel striations are visible, but other body tissues appear irregular or indistinct and remain interpretively ambiguous.

The stalk occurs in variable lengths on similar-sized bodies, and shows a considerable degree of flexibility. Reflective longitudinal stripes are often visible, and may represent contractile musculature as suggested by Collins and Rudkin (1981).

3.9.2 *Abundance and distribution of Priscansermarinus*

In total, 132 individual *Priscansermarinus* fossils were recovered in this study, representing about 1.7 % of the fauna. All individuals appear to be complete and are thus judged to represent part of the original living community.

Priscansermarinus occurs mainly at three distinct stratigraphic levels (Figure 21): RQ 8.9 m, 9.5 m and 13.5 m. This compares well with the abundance of cancelloriids (Figure 18) on the same stratigraphic levels, but the association with the hyolithid *Haplophrentis* (especially with articulated opercula and helens) reported by Collins and Rudkin (1981) seems to be an unique case.

The lateral extent of *Priscansermarinus* relative to the Cathedral Escarpment was limited to about 30 – 50 m. No other occurrences were noted. This may strengthen the

argument for autochthony of the colonies, since sorting of whole animals by size does not seem to have played a significant role anywhere in the excavated sediments of the Raymond Quarry Member.

3.9.3 *Life habits of Priscansermarinus*

A basal attachment is present on most specimens at the free end of the stalk, but as Collins and Rudkin (1981) observed, there is nothing present on any specimens to indicate what this apparently gregarious animal may have attached to. Clusters of other sessile animals in the Raymond Quarry fauna (e.g., cancelloriids) appear to represent original communities (Collins 1996) buried in place, and the lack of evidence for mechanical sorting in *Priscansermarinus* is consistent with *in situ* burial as well. If so, then the widened base most likely served to anchor the animals shallowly in the muddy bottom, instead of attaching to a firmer substrate as in the cancelloriids. Alternatively, all of the *Priscansermarinus* specimens may have been torn from their original substrates, implying a relatively weak point of attachment. If this was the case, then all specimens must be regarded as parautochthonous.

3.9.4 *Feeding strategy and trophic status of Priscansermarinus*

As a sessile organism, it is presumed that *Priscansermarinus* was a filter feeder. The fine striations in the main body portion may represent the filtering apparatus, but the anatomy of this animal is not clear in the fossils.

3.10 *Pagetia bootes* and *P. walcotti* (Arthropoda, Trilobita)

3.10.1 General notes on *Pagetia* and other trilobites

The trilobites constitute a relatively minor component of the Raymond Quarry fauna, totaling only 208 non-moult individuals (about 2.7 %). About ten genera are represented (in descending rank-order) : *Pagetia*, *Olenoides*, agnostids (possibly more than one genus?), *Naraoia*, *Oryctocephalus*, *Chancia*, *Parkaspis*, *Elrathina*, *Kootenia* and *Ehmaniella*. The latter genus is represented only by exuviae in the measured strata of the lower Raymond Quarry Member, but occurs more frequently (and complete) in the unmeasured samples taken from the uppermost levels, in association with a large number of *Tuzoia* carapaces.

Two species of the small (3 -- 5 mm) eodiscid *Pagetia* are present in the Raymond Quarry fauna: *P. bootes* and *P. walcotti*. *P. bootes* occurs only in the lowest part of the Raymond Quarry Member (Fletcher and Collins 1998), so the vast majority of specimens under consideration in this study consist of *P. walcotti*.

3.10.2 Abundance and distribution of *Pagetia*

Pagetia is overwhelmingly the most abundant trilobite in the Raymond Quarry (114 individuals, accounting for about 1.5 % of the fauna), enough to be considered part of the trophic nucleus of this study. Additionally, fragments of this trilobite (presumed to represent exuviae or dead individuals) occur in such profusion on some horizons that no attempt was made to collect or count them.

The stratigraphic distribution of *Pagetia* in the Raymond Quarry Member (Figure 22) shows that the animal was a common (i.e., normal) inhabitant of the fauna

throughout. Several maxima are observed in higher stratigraphic intervals, but these do not correlate with any other organisms. A possible exception might be a negative relationship with the presence of the medusoid cnidarians, whose respective maxima and minima seem to oppose those of *Pagetia* (compare with Figure 24).

No trends in lateral distribution of *Pagetia* were noted with respect to distance from the Cathedral Escarpment. The trilobite occasionally occurred in clusters, but the significance of this is uncertain, owing to a lack of other evidence regarding mode of life and feeding strategy.

3.10.3 *Life habits of Pagetia*

Agnostids (rare in the Raymond Quarry fauna) were most likely pelagic (Robinson 1972). *Pagetia* shares a general similarity in size and form that would suggest a similar habit. Unfortunately, appendages are still not known in any of the eodiscids for comparison. They are however, widely distributed geographically in a variety of sediments (Jell 1975), which is consistent with a pelagic existence. Conway Morris (1986) presumed that the presence of pelagic animals in the Phyllopod Bed could be attributed to dead individuals sinking to the sediment, or entrapment in turbidity currents. The latter is not supported by the sediment-fossil relationship observed in the Raymond Quarry Member (see Chapter 2).

Enrollment is commonly observed in the fossils of *Pagetia*. Jell (1975) suggested that this condition was not likely maintained for long periods in life, since the animals respiratory tissues would have been sealed from the oxygenating environment. Thus,

enrollment was most likely a protective behavioral response to environmental adversity and/or predators.

3.10.4 *Feeding strategy and trophic status of Pagetia*

Jell (1975) could find no major structural differences between the hypostomes of agnostids and *Pagetia*, probably indicating a similar feeding strategy (i.e. in the pelagic zone). He proposed a filter-feeding diet of phytoplankton, but again, the appendages are not available for confirmation of this, and gut contents are not preserved in any specimens.

Pagetia is known to occur in the posterior gut of *Sidneyia*, showing direct evidence of predation. Disarticulated fragments of *Pagetia* strewn at one end of an *Ottoia* feeding burrow suggest predation, and may point to an occasional benthic habit for this trilobite.

3.11 Undescribed medusoids (Cnidaria)

3.11.1 *General notes on the undescribed medusoids*

The fossil record of jellyfish is predictably scarce, owing to their extremely low preservational potential. Given that well preserved ctenophore fossils occur in Lower and Middle Cambrian strata (Conway Morris and Collins 1996), jellyfish body fossils may well be expected in the same deposits, especially since their preservational potentials may be considered equivalent. Here, tentaculate medusiform jellyfish body fossils from the Middle Cambrian are reported; at present they are the oldest such examples known.

The medusoids under consideration here may be of two or more varieties, but taxonomic descriptions have not yet been attempted. Absolute distinction of each kind is complicated by the lack of specimens preserved in oral/aboral view (all specimens appear to be laterally compressed, probably because of their elongated bell outlines). They are treated as a single faunal unit in this work, based on their generally similar form, life habits, and feeding strategy (see below).

Three distinct degrees of weathering were observed in the medusoid fossils, each producing variable resolution of detail. Most commonly, the organisms produced a fossil of moderate relief (up to several millimetres), which suggests a fairly tough construction in life. Natural separation of the fossil part and counterpart appears to have occurred in many examples during the process of post-orogenic weathering of the shale. This has produced specimens with a marked colour contrast (yellow-green body fossils on a brown matrix) where weathering has been slight, or no colour contrast at all (i.e., relief only) in more advanced states of weathering. Internal details are scarce in this mode of preservation, except for occasional identifiable gut contents.

On fresh unweathered matrix, the fossils appear as a silvery reflective film on natural bedding planes. Low relief (about 1 mm) is sometimes apparent where the bell structure is folded upon itself, but more often there is no relief expressed at all. Some of these specimens show traces of internal structures that are comparable to those found in living medusoids.

A wide range of body size was observed, from specimens measuring less than 5 cm on their longest axis to animals with longitudinal measurements exceeding 25 cm and attaining bell widths of about 20 cm. Some of the fossils exhibit a mottled and wrinkled

area along the length of the bell in contrasting relief to flanking areas which are comparatively smooth, suggesting that the bell was lobed. Tentacles are visible on most specimens, delineating the margin of the subumbrella and oral opening. They occur in a variety of lengths, even on similar-sized animals. On fossils where they are not visible at all, they may have been withdrawn completely into the bell, or possibly torn off prior to burial. The fringe formed by the tentacles appears to have been continuous.

3.11.2 *Abundance and distribution of the undescribed medusoids*

A total of 104 specimens are considered in the fauna (constituting about 1.3 %). This is almost certainly an underestimate of their original proportion in the living population, since incomplete or poorly preserved individuals may be impossible to identify. Additionally, as residents of the pelagic realm, they would have been less likely to be inundated by sediments, except possibly when they were actively feeding on the bottom (see below).

The fossil medusoids have so far been recovered only from the Raymond Quarry Member of the Burgess Shale. Maximum abundance occurs between the RQ 9.5 m and 11.5 m levels, while the known total range extends from RQ 8.0 m upward to approximately 13.4 m (Figure 23). The main concentration and prominent occurrences appear to show a negative correlation with *Pagetia*, but the significance of this is uncertain. Their respective distributions may have been dependent on other environmental factors.

The lateral distribution of the medusoids was very restricted, with virtually all specimens having come from sediments about 30 – 50 m south of the Cathedral

Escarpment. The size range of these animals may be taken as evidence against mechanical sorting as the cause, but another explanation is presently lacking for this observation.

3.11.3 *Life habits of the undescribed medusoids*

The medusoid is the active locomotory life stage in cnidarians, which may occasionally become secondarily sessile (e.g., modern *Cassiopea*, which resides upside-down on the bottom of quiet shallow water). However, the lack of medusoid fossils presenting an oral view and the dimensions of the bell both indicate that these forms were primarily swimmers. The tall box-like form of the exumbrella is comparable to modern 'sea wasps' (cubozoans), which are known for their strong swimming ability. Cubozoans possess a muscular velarium shelf on the subumbrellar surface, which constricts the jet of expelled water during locomotion. Unfortunately, the presence or absence of such a feature is obscured by the lateral compression of Raymond Quarry medusoids. The presence of benthic and pelagic prey in the gut cavity (see below) indicates that the medusoids explored both realms.

3.11.4 *Feeding strategy and trophic status of the undescribed medusoids*

The gastrovascular cavity and manubrium are sometimes distinguishable in the fossils. These structures were completely enclosed within the bell, and have not been observed extending beyond the oral opening. Thus, prey was most likely brought to the oral opening by the contractile tentacles.

A total of 14 individuals (about 13.5 %) contain other animals within the bell outline. Some of these may represent chance superposition, but the following evidence suggests that some (or even all) represent whole animals ingested by the medusoids. Originally gelatinous animals such as the ctenophore *Ctenorhabdotus* (Figure 24) and lightly sclerotized animals such as *Ottoia* (ROM 97-206) are highly degraded (i.e., partially digested). An example containing the relatively more taphonomically resistant non-biomineralizing form *Leancoilia* (Figure 25) is more conspicuous, but the overlying medusoid tissues obscure fine details. Animals with biomineralized integuments such as the hyolithid *Haplophrentis* (Figure 26) and the trilobite *Olenoides* (also in Figure 25) are preserved with typically higher relief. In the case of *Haplophrentis*, opercula and helens are often associated but have become detached or slightly displaced as if digestive enzymes had begun to degrade the softer connecting tissues. The trilobite is a complete, fairly small adult (in terms of average-sized individuals). The relative rarity of non-moult remains of this trilobite in the fauna (about 0.4 %) may be taken as positive evidence of predation, if only because chance superposition between rare taxa is less likely. If the predatory (or at least carnivorous) taxa *Ottoia*, *Olenoides* and *Leancoilia* can be considered normal prey of the medusoids, then the medusoids must be considered secondary predators. Additionally, if *Ottoia* was a secondary predator (see Chapter 2), then the medusoids must be elevated to the tertiary level.

Benthic feeding is uncommon among extant forms, but analogous behavior is exhibited by some of the crawling hydrozoans such as *Cladonema* and *Eleutheria* (Mackie 1974). These modern forms have tentacles that are thickened and modified into

effective walking appendages, so the comparison with Cambrian medusoids may be entirely superficial. Although the Raymond Quarry medusoids may have moved along the muddy bottom in search of prey, the slender nature of their tentacles appear to have been poorly adapted for extended periods of ‘walking’. As with extant medusoids, prey were most likely chanced upon, and not actively pursued (Mackie 1974). In such a case, the optimal strategy of a cruising predator is to rely on slow moving prey (Arai 1997). The feeding tentacles would have acted as the primary sense organs for locating food.

Medusoids are relatively unimportant to higher-level carnivores in modern oceans (e.g., Verity and Smetacek 1996); some large arthropods are known to feed on them (Arai 1997), as well as fish (e.g., Barnes 1987) but other medusoid consumers (e.g., turtles and birds) lack a Cambrian analogue. Recent discoveries of Lower Cambrian agnathans (Shu et al. 1999) may indicate a potential medusoid predator, but no similar forms have been found in the Burgess Shale. All life stages of a medusoid offer very low nutritional value to potential predators, owing to their low concentrations of protein and lipids (often less than 1 %) and high water content (95 – 96 %) (Bailey et al. 1995). The abundance and large size of the Raymond Quarry fauna medusoids may be attributed to low adult mortality and abundant benthic prey.

3.12 *Hurdia* sp. (Arthropoda, Dinocarida)

3.12.1 *General notes on Hurdia and other dinocarids*

The class Dinocarida was erected by Collins (1996) to include the anomalocarids (= Radiodonta), as well as *Opabinia*. The Raymond Quarry fauna contains a substantial

number and variety of dinocarids, including *Anomalocaris canadensis*, *Laggania cambria* and *Hurdia* sp.

Typical dinocarid bodies were fusiform and composed of two non-biomineralized tagmata (head and trunk). The head region bore the pre-oral appendages ("claws"), eyes, and oral aperture ("jaws" in the Radiodonta). Behind the head a series of metameric trunk segments was present, each bearing swimming lobes equipped with gills. In some genera (e.g. *Anomalocaris* and *Opabinia*) the posteriormost three segments of the trunk bore dorsally directed lobes modified into larger wing-like processes constituting a kind of tail.

Dinocarids (particularly *Anomalocaris*) have received much attention in the literature, due in part to their convoluted history of taxonomic interpretation (Collins 1996), and their trophic status as a 'top-predator' (see below).

Only *Hurdia* is sufficiently abundant among the dinocarids to be included in the trophic nucleus of the Raymond Quarry fauna. Because this animal is poorly understood at present, species determination is ambiguous. According to D. H. Collins (pers. comm.), *Hurdia* is likely to differ considerably from the first preliminary attempts to describe it (Walcott 1912a).

All existing specimens of *Hurdia* are disaggregated to some extent, and so appear to be preserved after a considerable state of decay had first been reached. This complicates both the determination of number of individuals (see below), and even the general appearance of the animal. Single (i.e., unpaired) *Hurdia* carapaces were repeatedly found closely associated with other well-sclerotized structures, often in a similar configuration. Their orientation and form suggest that, together, these represent

components of the head. In addition to the *Hurdia* carapace, the head apparently included a “*Peytoia*” mouthpart, a pair of “Appendage F”-like claws (c.f. Briggs 1979), and a paired (‘bivalved’) carapace referred to in literature as “*Proboscicaris*” (c.f. Rolfe 1962, Simonetta and DelleCave 1975). Since the numerous associations available exhibit considerable variation, the exact configuration of these parts is not known. The carapaces do not form a complete envelopment of the cephalic region (D.H. Collins, D.M. Rudkin, pers. comm.). Presumably arthroidial membranes connected the spaces in between, but did not survive fossilization. They would have provided the head with some degree of flexibility – a feature common to the related form *Anomalocaris* (Collins 1996).

Much less can presently be known of the trunk of *Hurdia*, since this part was apparently covered with a relatively insubstantial integument (in comparison with the known head structures), which broke up easily upon death. Large, highly biodegraded specimens show that the lateral flaps were numerous, robust in their dimensions, and had a large surface area imparted by surface grooves. No walking appendages have been found in association with *Hurdia* fossils, and the extreme posterior end is completely unknown.

3.12.2 *Abundance and distribution of Hurdia*

The total number of *Hurdia* considered within this fauna was established with some difficulty. The animal disaggregated easily, and presumably left behind a considerable number of moult remains with some fossilization potential throughout its life. However, a total of 74 specimens are included here (about 1 % of the fauna), based mostly on close associations of the sclerotinous cephalic components. The degree to

which this number reflects the original living proportion is not known. Some of the ‘unidentified anomalocardids’ in the fauna (more than 30 of which appear to represent fossils of animals buried alive) may represent portions of *Hurdia*, simply lacking diagnostic parts. Also the large number of ‘moult’ remains may actually represent some individuals that had in fact been part of the living biota but were killed prior to burial and subsequently disaggregated and became indistinguishable from true moult remains.

The stratigraphic distribution of *Hurdia* fossils within the Raymond Quarry Member (Figure 27) shows no distinct peaks of abundance, perhaps indicating that the animal maintained a more or less constant population size relative to the overall abundance of other animals in the fauna. Cephalic assemblages occur with a low frequency that seems to correspond with the abundance of preserved ‘moult’ fragments (mostly isolated carapaces). Nearly complete individuals occur at RQ 8.3 m and 20+ m.

Laterally, occurrences of isolated *Hurdia* carapaces were essentially uniform throughout the excavation, except in the furthest north and south extensions. Assemblages and nearly complete animals occur mostly at 45 – 60 m from the Escarpment base, with minor outliers. The abundance of *Anomalocarus* body fossils somewhat closer to the Escarpment generally corresponds with fewer *Hurdia* remains, suggesting that these genera did not compete directly, each preferring a slightly different habitat. Here, this seems to correspond with distance from the Escarpment, observable over a few metres, possibly reflecting a preference for a particular suite of prey animals, or simply a (gradual?) partitioning of their respective hunting territories.

3.12.3 *Life habits of Hurdia*

The well-developed lateral flaps of *Hurdia* were adapted to provide locomotion through the water column by undulatory metachronal movements, much like that described for *Anomalocaris* (Whittington and Briggs 1985). Their large size and rib-textured surface would have provided an efficient means of gas exchange, especially while in motion (when metabolic oxygen requirements would have been highest).

The overall shape of *Hurdia* in life remains vague at best. Poorly preserved body remnants suggest that it was tapered toward the posterior (as were all other known dinocarids) in order to provide a greater degree of hydrodynamic efficiency. *Hurdia* was most likely an active swimmer, with little or no ability to walk on the muddy bottom.

3.12.4 Feeding strategy and trophic status of *Hurdia*

The large, well-sclerotized appendages of *Hurdia* differ in form considerably from the claws of *Anomalocaris* (see Figure 28), and more closely resemble those of *Laggania* (c.f. Collins 1996, Figure 8 and 9, p. 290), and to a lesser degree, those of the Lower Cambrian form *Parapeytoia* (c.f. Hou et al. 1995). This suggests some similarity in function. Based on their serial comb-like edges, the claws seem best adapted for the capture of food: hence their unofficial designation ‘appendage F’ (Briggs 1979). The morphology of these appendages suggests that they were not employed in walking or breaking up food, especially since the articulating segments did not provide a high degree of motion within the limb (Briggs 1979). However, once food was captured, transfer to the mouth was entirely possible. A wide range of motion was apparently provided by arthroidial membranes at the point of attachment to the head, which seems typical of the

dinocarids (e.g. *Anomalocaris*), and the close proximity (as demonstrated by intimate associations in the fossils) of the jaws and claws.

The 'Peytoia'-like mouth or jaw apparatus of *Hurdia* (Figure 28) was similar to that possessed by *Anomalocaris*. However, fossils of this part differ significantly enough to identify them even when separated from other body parts and preserved as a discrete unit. Collins (1996, Fig. 5) showed that the jaw of *Anomalocaris* was distinctly diamond-shaped in outline, whereas that belonging to *Hurdia* was comparatively circular, and perhaps more recalcitrant. The latter observation is supported by a consistently higher degree of relief (i.e., they better withstood the effects of compressional force). Behind the outer circlet of teeth (i.e., in the anteriormost portion of the pharynx), many specimens show additional arc-shaped tooth structures in several rows. It is not known exactly how the jaws operated to reduce prey once introduced to the mouth; as with *Anomalocaris*, the outer sclerites of the jaws appear to have been fixed, and almost certainly could not occlude. Butterfield (1991) noted that this kind of jaw apparatus has a limited feeding application, and is comparable to the suctorial / parasitic mouth armory of certain modern lampreys. A suctorial function is certainly possible for the 'Peytoia' mouth, but a parasitic habit can not be inferred without a suitable host.

Identifiable gut contents of *Hurdia* have not yet been observed. Very few trunk portions of the body are preserved as fossils, and none of these are oriented to provide a view of the ventral midline where the alimentary canal is expected to occur.

Non-teratological aberrations of some animals (e.g., *Helmetia*, Figure 29), which appear to represent damage caused by predatory attack, may be attributed to *Hurdia* or a

related animal. However, this speculation is based solely on the lack of evidence for other suitable large predators.

The armoured cephalic region, with carapaces unique among the dinocarids, suggests that some measure of protection was necessary. Whether this was for protection against predators (e.g. other dinocarids) or combative prey is not known. Some isolated carapaces do show damage, but this may be attributed to post-mortem scavenging or purely mechanical (non-biogenic) processes. The large size of the adult *Hurdia* and its likely ability to swim and hence escape capture would seem to indicate that it was not common prey of any other known predator.

CHAPTER 4: SYNECOLOGY OF THE RAYMOND QUARRY FAUNA

4.1 Introduction

Fossils representing the Raymond Quarry fauna record the presence of an identifiable community that persisted and changed through the deposition of the lower part of the Raymond Quarry Shale Member. Decimetre-scale analysis of diversity and population changes upward through the Raymond Quarry Member (and thus over time) allows a breakdown of the major trends.

The number of taxa present in each decimetre interval of the Raymond Quarry fluctuates (Figure 30), with maximum absolute diversity reaching 29 separate taxa (RQ 8.8 and 9.0 m). There is a positive correlation between the total number of fossils recovered at each level (Figure 31) and the observed diversity, but the relationship is variable. Since the Shannon-Wiener index takes into account both numerical abundance and the relative proportions of taxa within each interval of sediment, a reasonably accurate assessment of changes in faunal diversity can be plotted (Figure 32). The 'stratigraphic interval' axis represents a kind of temporal scale, but the regularity and duration of burial events remains speculative and poorly constrained. An inspection of this graph reveals initial low diversity and widely fluctuating values for H_s below RQ 8.0 m. The statistical validity of H_s as a true measure of relative diversity at these levels is questionable, given the low number of fossils recovered, partially because relatively little rock volume was available for excavation.

A degree of 'stability' may be recognized between RQ 8.0 and 11.8 m, with higher but generally declining relative diversity. A conspicuous and apparently

anomalous drop in *Hs* at RQ 8.4 m is imparted by a concentration of the sponge *Choia*, despite a relatively high absolute diversity of 22 recognized taxa. *Choia* has an extremely patchy distribution (Section 3.3): about 86 % of specimens in this interval (520 of 605 individuals) were present on a single slab. The effect of this clumping on *Hs* was a lowered value (i.e., low uncertainty), but the exact amount of exaggeration is impossible to determine.

Maximum relative diversities were observed at RQ 8.7 and 8.8 m respectively. However, RQ 8.8 m produced 8 more recognizable taxa, a difference of more than 27 %. The similarity of their relative diversities is a result of more evenly distributed numbers of organisms in each separate taxon within the RQ 8.7 m interval. There is a general decline in relative diversity from RQ 8.7 m upward to the top of the Raymond Quarry Member. Stratigraphic horizons above about RQ 12.0 m were less thoroughly sampled, and the numerical data can not be analyzed with the same confidence. Large and apparently chaotic changes in relative diversity above RQ 12.0 m may also be explained by corresponding lower values of absolute diversity, whose maximum value of 10 thereafter is reached only twice (at RQ 12.5 and 13.4 m), and still represents less than 35 % of maximum values.

A strict mathematical comparison of the changes in diversity and populations is hampered by inconsistencies in the sampling quantity for strata above RQ 12.0 m. If taphonomic filtering was not substantially more effective in the higher levels of the Raymond Quarry Member (Section 2.4), then the sparse nature and low diversity of taxa observed there may reflect real, if not precisely measured, indications of increased environmental adversity toward Raymond Quarry organisms.

4.2 The Raymond Quarry fauna: RQ 8.0 – 12.0 m interval

Data are lacking to interpret the lowermost strata exposed in the Raymond Quarry Member (i.e., below RQ 8.0 m) in terms of either relative or absolute diversity. The contact between the Walcott Quarry Member and the Raymond Quarry Member (see Fletcher and Collins 1998) was not investigated specifically in this study, so at present no statements can be made regarding the sharpness of faunal change that occurs there. Soft-bodied preservation occurs only within specific bands of rock in the Phyllopod Bed, further complicating direct comparisons with the Raymond Quarry fauna.

The Raymond Quarry fauna appears to be best expressed at about RQ 8.7 – 8.8 m, based on the highest relative and absolute diversity measurements recorded there. Thereafter a trend of decline is observed, which may represent a gradual shift to environmental conditions that increasingly disfavoured the habitat of the constituent taxa. The ‘zigzag’ pattern of change in relative diversity observed in Figure 32 is problematic, especially since each of the decimetre intervals include several (about 3) burial events. It is plausible that low-diversity bedding planes represent obrution of incompletely ‘mature’ communities; however, juvenile sessile organisms are not especially common at any horizon, and mobile forms would be expected to re-establish themselves relatively quickly.

Widely ranging values of relative diversity above RQ 12.0 can be attributed to a combination of inconsistent and generally smaller sample sizes (i.e., surface area of bedding planes observed), as well as real paucity of preserved remains. Shelly beds and trace fossils (Allison and Brett 1995) are more common in higher strata (above RQ 12.0

m), and the lack of associated soft-bodied remains clearly indicates some degree of preservational bias. The trend toward shallowing upward as the basin filled with sediment may have resulted in episodic penetration of the oxycline well into the sediment, allowing a wide variety of aerobic decay agents access to potential fossils, effectively eliminating evidence of soft tissues there. Descriptions of changes occurring in the Raymond Quarry fauna are therefore limited to strata between RQ 8.0 and 12.0 m. Intervals of faunal change are shown in Figure 33.

4.2.1 Interval A: RQ 8.0 m through RQ 8.1 m

The lowest portion of well-exposed strata in the Raymond Quarry Member excavations revealed about 20 cm of sparsely fossiliferous rock. The degree of taphonomic bias was presumably minimal, as fossils of the lowest preservational potential are present (e.g., undescribed medusoid at RQ 8.0 m, and undescribed benthic holothurian at RQ 8.1 m), along with other ‘typical’ non-biomineralized. The relatively low number of fossils recovered might be attributed to undetermined environmental conditions that were not ideal for the living Raymond Quarry fauna, but sufficient enough to support lower populations of representative taxa.

The RQ 8.0 m segment produced a trophic nucleus with 80 % of individual fossils represented by 25 % of the taxa occurring there. The RQ 8.1 m segment was less fossiliferous, and a trophic nucleus is not clearly defined (i.e., more than 20 % of individual fossils represented single occurrences of each taxon).

Shared major taxa between these segments include *Leancoilia*, *Ottoia*, and *Vauxia*. These taxa occurred in similar rank-orders and proportions. This differs from

the proportions of these taxa in the whole Raymond Quarry fauna, where *Ottoia* was more abundant than *Leancoilia* overall.

Interval A marks the first known stratigraphic occurrence of *Anomalocaris* in the Raymond Quarry fauna, and contains one of only two segments (RQ 8.0, and RQ 9.7 m of interval E) in which this taxon occurs in great enough numbers to warrant inclusion within a clearly defined trophic nucleus.

4.2.2 Interval B: RQ 8.2 m through RQ 8.6 m

Interval B strata may be characterized by the first numerically abundant fossils to appear in the Raymond Quarry fauna succession. If this is not the result of under-sampled lower strata then it is provisionally concluded that this Interval of segments marks the establishment of the Raymond Quarry fauna.

The numerical dominance of *Choia* in most of the segments is a conspicuous feature of this Interval. *Choia* appears to be absent altogether from the RQ 8.3 m segment, where *Ottoia* replaced it in rank. As a result, there are no taxa common to all of the trophic nuclei in Interval B. *Choia* reappears in such numbers that it is the only taxon constituting the trophic nucleus at RQ 8.4 m.

A unique colony of *Tubulella* (with several *Micromitra* attached in life position; see Figure 8) occurred at RQ 8.5 m, accounting for a relatively high rank for this taxon in the segment. *Tubulella* occurs commonly throughout the Raymond Quarry Member, but usually as short fragments of empty tubes (which are eliminated from the analysis) and therefore does not form part of any other trophic nucleus thus far identified.

4.2.3 Interval C: RQ 8.7 m through RQ 8.9 m

The abundance of fossils throughout this Interval is characteristically high, and increases upward. Although the lowermost portion of Interval C (RQ 8.7 m) produced the fewest fossils, relative diversity is higher ($H_s = 1.066$) than any of the segments in the entire Raymond Quarry fauna. The highest absolute diversity ($T = 29$, at RQ 8.8 m; see also Interval D) is also reached, though not sustained. High relative and absolute diversities, combined with relatively high abundance of organisms is taken as evidence that the Raymond Quarry fauna was reaching a kind of apex. It must be presumed that these sediments record a period of time in which palaeoenvironmental conditions were most favourable to Raymond Quarry fauna-type animals.

A total of five taxa (*Leancoilia*, *Vauxia*, *Ottoia*, chancelloriids and *Pollingeria*) are shared between all of the well-defined trophic nuclei in Interval C. Although this may be taken as evidence of some stability in the fauna, the rank-orders of the common taxa between segments appear to have been in a state of flux.

Priscansermarinus and the undescribed benthic holothurian ‘Creeposaurus’ appear to be important organisms within segment RQ 8.7 m, but both organisms just fail to meet the specific criteria for inclusion within this trophic nucleus. *Priscansermarinus* appears to become more important during the transition between Intervals D and E (RQ 9.4 – 9.5 m).

4.2.4 Interval D: RQ 9.0 m through RQ 9.4 m

Interval D is characterized by the highest overall abundance of fossils throughout (with the exception of segment RQ 8.4 m in Interval B), although there is considerable

variability in this respect. The lowest fossil numerical abundance in this Interval ($N = 168$ at RQ 9.2 m) produced the highest relative diversity ($H_s = 1.041$). Absolute diversity reached its highest level at segment RQ 9.0 m ($T = 29$; see also Interval C), but as in Interval C this condition was not sustained. In fact, this Interval concludes with the greatest reduction in absolute diversity (a loss of 12 taxa) in the Raymond Quarry fauna. These figures, taken together, may be interpreted as a continuation (or re-emergence) of the Raymond Quarry faunal apex. However, the diminishing absolute diversity must indicate that this phase was somewhat short-lived, in terms of the total duration of the fauna.

The trophic nuclei in Interval D are well defined, but share only two taxa between all of them (*Ottoia* and *Pollingeria*). Numerically, *Choia* dominated most of the segments, with a major exception at RQ 9.2 m where it was apparently absent and, like RQ 8.3 m (Interval B), it was replaced in rank by *Ottoia*. Additionally, segments RQ 8.3 and 9.2 m shared very similar trophic nuclei, in having the same top five dominant taxa, with only slight variation in their rank-orders. The importance of *Choia* was re-established at RQ 9.3 m, and it remained abundant until the end of this Interval, though in diminished numbers.

Leancoilia remained conspicuously low in rank within the trophic nuclei of every segment except for RQ 9.1 m, where it was excluded by two rank-orders (after *Sidneyia*). The low rank of this otherwise abundant genus may also be considered distinctive of Interval D.

The numerical dominance in segment *Priscansermarinus* in segment RQ 9.4 m is unique in the Raymond Quarry fauna. Because of its clumped distribution (Section

3.3.2), the true importance of this taxon in the segment is difficult to gauge. Nevertheless, this phenomenon appears to have been unique, and the remainder of the trophic nucleus is compositionally similar to others in the Interval.

4.2.5 Interval E: RQ 9.5 m through RQ 11.4 m

Interval E is the thickest complete succession (i.e., with known stratigraphic boundaries above and below) identified in this study and, as such, it probably represents the longest temporal duration. Total fossil abundance was highly variable but shows a decreasing trend, as does absolute diversity. To some degree this may be the result of variations in rock volume sampled. However, obvious trends in relative diversity are lacking; there is little variation considering the supposed length of time represented. The decreases in number and absolute diversity of fossils are probably a reflection of diminishing quality of specific environmental conditions favoured by the Raymond Quarry fauna.

Two taxa are common to all of the trophic nuclei in this Interval (*Ottoia* and *Leancoilia*). *Pollingeria* appears to have been important, and sometimes numerically dominant, except for segments at RQ 10.7 m (see below) and RQ 11.1 m, where no examples were found at all. These levels represent two of four temporary marked drop in numbers of the dominant taxa (also at RQ 9.9 and 10.1 m) recognized in the sequence. Several abundance peaks for the same taxa were observed, although they do not appear to be as clearly defined. If these trends are not the effect of natural patchiness, then these major perturbations probably indicate that the palaeoenvironment was in a state of flux.

This would result in population instability, but the palaeoenvironment seems to have returned to more favourable conditions repeatedly for some period of time.

Two phases of absolute diversity may be recognized in Interval E. The first phase (RQ 9.5 – 10.6 m, where $T = 17$ to 26) appears relatively stable, while the collapse at RQ 10.7 m may be significant. This segment represents the first undefined trophic nucleus to occur in the sequence since the putative establishment of the Raymond Quarry fauna. Although a brief ‘recovery’ appears to have followed in the second phase (RQ 10.7 – 11.4 m), absolute diversity ($T = 10$ to 16) failed to reach previous levels. This may be interpreted as a clear signal that the environmental changes occurring at this specific location were of a permanent nature, and were not favourable to the Raymond Quarry fauna.

The top rank-order taxon in each segment was always found to be one of the three most numerically dominant organisms characterizing Interval E, including *Pollingeria* (when it was present at all). Even though immobile benthic forms are included in most of the other trophic nuclei in the Raymond Quarry fauna, they rank consistently low, and by the second phase, always in the lowest rank, if at all.

4.2.6 Interval F: RQ 11.5 m through RQ 12.0 (+?) m

A marked reduction in fossil abundance and diversity, as well as some degree of localized preservational bias characterize Interval F. The present degree of sampling above the RQ 12.0 m level was deemed insufficient to warrant specific comparisons with lower strata (as outlined in Section 4.1), but this Interval likely extends further upward. Spot sampling of strata above RQ 12.0 m to the top of the Raymond Quarry Member

produced few fossils, except for the uppermost 3 m. There, valves of the probable arthropod *Tuzoia* are exceptionally common (see also Fletcher and Collins 1998), and often articulated in pairs, although none show evidence of associated soft tissues.

The last well-defined trophic nucleus in the Raymond Quarry faunal sequence was observed at RQ 11.5 m. This segment is distinct in composition from the relatively long succession of similar ones in Interval E, even though absolute diversity ($T = 14$) remained much the same. Above RQ 11.5 m, trophic nuclei are not defined, and more than half of the diversity of each segment is accounted for by single occurrences of particular taxa.

There are no shared taxa between either the incomplete trophic nuclei, or between all of the segments, even when all of the constituent taxa are considered. However, four taxa were variably present in all but one segment each (*Ottoia* and *Leancoilia*: RQ 11.7 m, *Micromitra*: RQ 11.9 m, and *Hurdia* RQ 12.0 m).

The above evidence seems to indicate that the environmental conditions necessary to support (and preserve) typical Raymond organisms had become sporadic and unstable. The appearance of unique taxa (e.g., *Alalcomenaeus* at RQ 11.5 m, and again in greater numbers above RQ 20.0 m) may reflect a shift, rather than decimation of the local ecology in response to the changing environment. The increasing occurrence of shelly debris, burrows and lack of associated soft tissue preservation (Allison and Brett 1995) is clearly indicative of taphonomic bias as well. Because of preferential preservation, we can not know, for example, what organisms may have been creating U-shaped burrows in the sediment, even if we may provisionally eliminate *Ottoia* from consideration (Section 2.4.4).

4.2.7 *Interpretive summary of trends*

Intervals A through F seem to show a complete cycle of community arrival, establishment and apex, declining stability, and finally departure. The completeness of the data is supported by the preservation of taphonomically delicate tissues throughout the succession, except in localized areas where burrows and shelly hash were abundant (particularly in higher strata, probably belonging to Interval F).

Interval A appears to have preserved the earliest stages of Raymond Quarry fauna arrival. This was probably due to increasingly favorable specific environmental conditions. The interval has not been completely sampled, since lithologically similar Raymond Quarry Member strata begins more than 3 m below the well-sampled strata at RQ 8.0 m. Spot sampling was possible only to a maximum depth to RQ 7.4 m, and indicated the presence of a small number of Raymond Quarry fauna-type organisms. Although sampling was minimal, the fossils in these lowest exposed beds seem to show atypical proportions (i.e., otherwise uncommon taxa), a local circumstance which might be expected before any fauna becomes established.

Interval B strata seem to indicate the first regional establishment of the Raymond Quarry fauna. However, there is a marked lack of cohesion between trophic nuclei with respect to constituent fauna. Although environmental conditions may have been improving insofar as typical Raymond Quarry organisms were concerned, the local ecology appears to have remained in a comparatively immature state. The importance of *Choia* at this stage probably means that this genus was opportunistic, but susceptible to great fluctuations, occasionally resulting in the complete elimination of local populations.

Intervals C and D may represent two different episodes of faunal climax. Each Interval is distinctive in composition, and this demonstrates a certain degree of flexibility in the Raymond Quarry fauna as a whole. However, the great reduction in absolute diversity at the end of Interval D reveals some vulnerability as well. Present evidence indicates that the most ideal environmental conditions for the Raymond Quarry fauna were comparatively short-lived. Whether or not these conditions shifted locally elsewhere is uncertain, since exposures of Raymond Quarry Member sediments are few in number, and have not yet been investigated as systematically as those on Fossil Ridge. There is no evidence of lateral faunal migration through time (e.g., along the Cathedral Escarpment base); exposures of Raymond Quarry-equivalent strata on the south face of Mt. Field and on the shoulder of Mt. Stephen are generally less fossiliferous. Repeated patterns of similar composition between Intervals B and D (at RQ 8.3 and 9.2 m) probably reflects an episodic return to near-identical conditions.

Interval E represents a comparatively long period of compositional stability in the fauna, typified by the importance of *Ottoia*, *Leandroilia* and *Pollingeria*. However, the distinct reductions of populations of these taxa, and their subsequent return to near-‘normal’ levels indicate episodic (periodic?) environmental perturbations that returned to previous conditions repeatedly. However, these perturbations appear to have become more severe in the second phase of Interval E, affecting the fauna more intensely.

Interval F marks the departure of the Raymond Quarry fauna, without any clear return to previous conditions. A permanent change is observed in the compositionally anomalous segment at RQ 11.5 m, after which no trophic nuclei could be defined. The evidence for taphonomic bias in these sediments indicates that bottom oxygenation

increased in local patches, paradoxically making newly-arriving taxa (e.g., the constructors of small U-shaped burrows) invisible, except as traces.

A large number of *Tuzoia* carapaces occurring in the top 3 m of the Raymond Quarry Member does not seem to represent a living community, but rather an accumulation of exuviae or dead individuals, perhaps sorted by currents in shallower water. The oncolite band conformably overlying the Raymond Quarry Member marks the beginning of the Emerald Lake Oncolite Member (Fletcher and Collins 1998), suggesting a marked decrease in water depth as the basin filled with sediment. The fauna of the overlying Member is distinctive from the Raymond Quarry fauna, but contains some similar elements in different proportions.

4.3 Middle Cambrian trophic web reconstruction

A tentative reconstruction of a Middle Cambrian trophic web was presented by Conway Morris (1986), based on fossils from the Walcott Quarry Member of the Burgess Shale (the 'Phyllopod Bed'). Primary production in that web was represented by benthic macro-algae (e.g., Walcott 1919) and acritarchs (Conway Morris 1986; see also Butterfield 1990), although quantitative data for both of these groups is presently inadequate. As a result, the bulk of Conway Morris' (1986) analyses concerned the macroscopic animal component of that assemblage. Evidence from morphological characteristics and, more rarely, identifiable gut contents (in the case of *Ottoia* and *Sidneyia*) were used to assign trophic levels of consumption. Inferences regarding diet, based on repeated associations on small sawn slabs (e.g., *Aysheaia* with sponges) were

also included. The single case of putative cannibalism by *Ottoia* (Conway Morris 1977) was reiterated as part of its normal feeding strategy, and shown in the reconstructed web.

Conway Morris (1986) found no direct evidence for anything other than primary carnivores, but acknowledged that his reconstruction of the trophic structure was almost certainly over-simplified. This suspicion is confirmed by the identification of anomalocarids as higher order predators (Whittington and Briggs 1985), and the discovery of undescribed medusoids with identifiable gut contents in the Raymond Quarry Member (Section 3.11.4).

Conway Morris (1986) also used the ratio of primary consumers (including both deposit and suspension feeders) to carnivores as an estimate of the efficiency of energy transfer between the two trophic levels. His data indicated an efficiency of about 7 % based on the number of individuals, and 52 % by his conversion to equivalent biovolume. The much higher figure based on biovolumetric estimates was deemed “slightly more accurate” (Conway Morris 1986, p. 446) due to the presumed closer relationship to actual production and standing crop (biomass) within each trophic level. However, the incompleteness of the web, especially in terms of higher order carnivory, suggested that a transfer efficiency of 52 % was too high. Indeed, an efficiency of 7 % accords better with other estimates for marine organisms at about 10 % (e.g., Stanton and Nelson 1980, Crame 1990, Butterfield 1997).

Conway Morris (1986) assumed minimal taphonomic bias in his palaeoecological analysis of the Walcott assemblage. However, because few animals revealed identifiable gut contents, and many of the animals were poorly understood, detailed web reconstruction and well-constrained estimates of trophic energy transfer were impossible.

These problems are magnified by the lack of evidence for autochthony in most of the Phyllopod Bed assemblages.

4.3.1 *The Raymond Quarry faunal trophic web*

The autochthonous (or at least parautochthonous) nature of the Raymond Quarry fossils and the additional identifiable gut contents of new taxa allows a more detailed understanding of community interaction with respect to trophic web reconstruction.

Significant differences between this web (Figure 34) and that presented by Conway Morris (1986) are due to compositional differences of their respective taxa. Although new information appears to increase the quality of web reconstruction, as well as estimates of energy and nutrient transfer efficiency to higher trophic levels, serious problems still remain unresolved with each. This demonstrates the limitations of such an exercise, especially since minimal taphonomic filtering has provided the best available resolution of Middle Cambrian ecology.

4.3.2 *Raymond Quarry trophic web: primary productivity*

Primary productivity in the Raymond Quarry faunal trophic web is divided into groups that are either under-represented in the collections (benthic algae), poorly known (all phytoplankton), or not likely to have been preserved at all (bacteria). Although trophic relationships can be inferred for these groups, the efficiency of transfer to higher trophic categories remains unknown. Also, no suitable candidate organisms were identified that would have been likely to assimilate benthic algal productivity directly (i.e., grazing taxa).

4.3.3 Raymond Quarry trophic web: primary consumers

'Deposit feeders' may not be represented at all as Lower and Middle Cambrian fossils, at least in the traditional sense of sediment swallowing (Butterfield, in press). Instead, benthic detritus feeding habits would have resulted in greater efficiency of carbon uptake, particularly since the sediments appear to have been poisonous. Some Raymond Quarry trilobites may have been 'deposit feeders' (i.e., detritus feeders?) (*Elrathina*, *Parkaspis*, *Chancia* and *Oryctocephalus*, e.g., Briggs et al. 1994) but Fortey and Owens (1999) have made a good case for a primitively predatory condition. Others may have included *Banffia* (Caron 1999), the undescribed benthic holothurian 'Creeposaurus'), and possibly *Skania* (c.f. Walcott 1931). These animals would have likely consumed some of the available benthic detritus (in competition with other scavengers), but a quantitative estimate of this energy and nutrient transfer also remains unavailable.

Suspension feeders represent the remaining portion of the Raymond Quarry primary consumer trophic level. These have been divided according to the tiered levels above the sediment that each Interval had the potential to exploit for nutritional resources. At the lowest level (< 1 cm), brachiopods (almost exclusively *Micromitra*) and hyolithids (*Haplophrentis*) probably shared the available phytoplankton while the sponge *Choia* would have most likely filtered nanoplanktonic bacteria, apparently without direct competition at this level. Mid- and high-level suspension feeders (1 – 10 cm and > 10 cm, respectively) are represented by a taxonomically diverse group of epifaunal sessile and pelagic swimming organisms. All of these would have probably depended upon

phytoplankton for food, except for the sponges and the ecologically similar cancelloriids. Although neither *Byronia* nor *Tubulella* have been found with their soft tissues preserved, they have been described as probable filter feeders (e.g., Mierzejewski 1986). For all sessile filter feeders, the height above the sediment achieved by them is a direct measurement of the maximum epibenthic tier that was being exploited. For example, *Echmatocrinus* and the cancelloriids routinely reached 15 cm, and the cnidarian *Mackenzia* was capable of upright lengths exceeding 28 cm (e.g., Figure 35); the sponge *Leptomitrus* (rare in the Raymond Quarry fauna) may have attained even greater height (personal observation).

Agnostids and *Pagetia* were probably pelagic (Robison 1972, Jell 1975), and able to exploit resources at any level of the water column in which they swam. The small bradoriid *Liangshanella* is presumed to be nektobenthic (Siveter and Williams 1997) and was therefore probably restricted to food within a few centimetres of the bottom. The large arthropod *Helmetia* appears to have been a swimming filter feeder (e.g., Briggs et al. 1994).

4.3.4 Raymond Quarry trophic web: primary carnivores/scavengers

Three phyla are assigned to the primary carnivore/scavenger level: priapulids (almost exclusively represented by *Ottoia*), arthropods (some 22 taxa dominated by *Leancoilia*) and ctenophores (*Ctenorhabdotus*). As such, the primary carnivores/scavengers exploited resources in, on, and above the sediment of the Raymond Quarry environment.

Priapulids were the only infaunal vagrant taxa identified. All of their known prey (hyolithids, brachiopods, bradoriids and probably *Pagetia*) possessed mineralized integuments, and thus were identifiable within the digestive tract of the predator. The presence of *Liangshanella* and *Pagetia* would indicate that these genera were at least occasionally benthic, since *Ottoia* almost certainly did not swim (Conway Morris 1977). Carbonaceous and possibly phosphatic material, occasionally found in the posterior gut cavity of *Ottoia*, are probably the remains of additional soft prey. Conway Morris (1977) also suggested a predatory habit for the priapulid *Louisella*, but the few available specimens lack any identifiable gut contents.

Sidneyia was a relatively abundant large carnivore whose gut contents also reveal a diet consisting of shelly (*Pagetia*, ?*Liangshanella*, brachiopods, ptychopariids and ?agnostids) and indeterminate soft prey. None of the identified prey items of *Sidneyia* appear to have been predaceous themselves.

Bruton and Whittington (1983) concluded that *Leancoilia* appeared best suited to exploit resources as a scavenger. Recent work by Butterfield (in press) on the nature of the apatite formations, which occur in the gut cavity of about half of the available specimens, may indicate that it was a predator. Alternatively, the elaborate gut diverticulum (comparable to modern arachnomorphs) may be interpreted as an adaptation to a diet consisting of scavenged food of high nutritional quality (i.e., animal carcasses). *Leancoilia* lacks any external features that would suggest it actually killed other animals, but it was well adapted to locate and manipulate already dead or dying ones.

Many other arthropods (including, for the purpose of this discussion, *Hallucigenia*) placed within the primary carnivore/scavenger trophic may have been

predominately, if not exclusively scavengers. They are: *Hallucigenia* (Conway Morris 1977a), *Waptia* (e.g., Briggs et al. 1994), *Banchiocaris* (Briggs 1976), *Canadaspis* (Briggs 1978), *Habelia* (Whittington 1981b), *Molaria* (Whittington 1981b), *Mollisonia* (Walcott 1912a) and *Yohoia* (Whittington 1974). Together with *Leancoilia*, these genera comprise about 37 % of this trophic category in the Raymond Quarry fauna. The implications for the estimation of trophic energy and nutrient transfer between categories are discussed in Section 4.5.

The ctenophores represent the remaining group of primary carnivores in the Raymond Quarry fauna, and all belong to the genus *Ctenorhabdotus*. An actively swimming mode of life is supported by the presence of 24 ciliary comb rows (Conway Morris and Collins 1996). The fossils reveal no evidence of tentacles, so feeding was presumably achieved by engulfing prey.

Trophic pathways for most of the primary level carnivore/scavenger taxa are omitted from the trophic web presented in Figure 34, as they would be purely conjectural.

4.3.5 Raymond Quarry trophic web: secondary (+?) carnivores

Although Whittington and Briggs (1985) identified *Anomalocaris* as a major predator, Conway Morris (1986) was unable to find direct evidence of carnivory beyond the primary level. The resulting simplicity of Conway Morris' (1986) trophic web does not seem to be an original feature of the living assemblage represented by the Phyllopod Bed fossils, but rather an effect of incomplete information, as he speculated. Direct evidence is still lacking for dinocarid predation on other predatory animals, since identifiable gut contents are not known. However, partially healed injuries to some

predatory trilobite genera are difficult to explain otherwise, and this has prompted speculation that *Anomalocaris* and its kin preyed upon both soft and biomineralizing forms (Nedin 1999). Although durophagy is not supported by fossil evidence in the way of gut contents, temporarily soft, post-ecdysal trilobites may have been vulnerable. A large predator such as a dinocarid may have also inflicted injuries to other animals (e.g., *Helmetia*, Figure 29). Based on this indirect evidence, the anomalocarids are placed among the rank of secondary (+?) carnivores. Because of their great size relative to most other Burgess Shale organisms, and their strong, spinose grasping appendages, it is presumed that these animals were capable of predation upon any other organisms that lacking a biomineralized integument.

The only direct evidence for secondary (+?) carnivory, available from the Burgess Shale so far comes from fossils of *Leanchoilia*, *Ottoia*, *Ctenorhabdotus* and possibly *Olenoides* preserved within the gut cavity of the undescribed medusoids (Section 3.11.4). Filter-feeding hyolithids also occur in the gut contents indicating that these organisms were non-selective predators. Identification of a ctenophore within the gut of the medusoids suggests that they hunted in the water column, as well as the benthos. The presence of *Ottoia* in the medusoid gut may further suggest predation on infaunal organisms. However, fluctuating oxyclines may have occasionally forced *Ottoia* to abandon their shallow burrows, leaving them vulnerable on the sea floor.

The secondary (+?) level of carnivores was probably not restricted to the medusoids and, presumably, anomalocarids. Any of the presumed primary level carnivores may have actually included other carnivorous animals in their diet. For example, *Sidneyia* was large enough and equipped sufficiently with robust and spinose

appendages to hunt just about any soft (and even biomineralized) animal, including other carnivores. However, the inability to recognize non-biomineralized, partially digested remains in the gut of most predators precludes anything but speculation regarding the full spectrum of their diet.

4.4 Organisms with unresolved life habits and trophic status

Although *Pollingeria* undoubtedly made important contributions to the palaeoecology of the Raymond Quarry fauna (about 15 % by number of individuals), the organism remains a complete enigma. Although there appears to be under-representation of both algae and primary consumers in the Raymond Quarry fauna, there is no good evidence that *Pollingeria* belonged to either group.

Indeterminate ‘worms’ may also represent a variety of taxonomic groups, even at the phylum level. Together, they constitute about 1.2 % of the Raymond Quarry organisms. None seem to closely resemble the form ‘*Ottoia*’ *tenuis* (c.f. Conway Morris 1986), a probable filter-feeding hemichordate (e.g., Briggs et al. 1994), but some appear to be remnants of shed cuticle from *Ottoia prolifica* (Section 3.2.2). The remaining ‘animals’ (if that is a correct interpretation) probably had a variety of life habits and trophic strategies, but certain modes may be eliminated from consideration. There is no resemblance to known algal remains. None of the ‘worms’ show evidence of sediment in their gut cavities (in fact, a gut cavity can not be identified in the majority of specimens), so sediment swallowing (i.e., deposit feeding) seems unlikely. Their relatively small diameters (in the 5 mm-range) and lack of obvious predatory features makes them unlikely candidates for high-level trophic status. Any of the remaining trophic categories

are available for speculation. As for life mode, a lack of attachment structures and a generally streamlined appearance accords well with some degree of motility.

The 'indeterminate arthropods' group (about 0.7 % of the fauna, by numerical abundance) consists of mostly small forms, several of which may represent new but undescribed genera. Because this is a mixture of animals united only by phylum-level designation, it is unlikely that they can be classified according to a single life mode or feeding strategy.

In total, almost 20 % of the fauna (by individuals) have not been resolved for their specific life habits or trophic strategies.

4.5 Estimates of energy and nutrient transfer

Conway Morris (1986) used the number of individuals, as well as estimates of biovolume (as a substitute for biomass) to calculate the transfer efficiency between Phyllopod Bed primary consumers and carnivores. Despite the wide range of size exhibited by different taxa, his calculations based solely on numerical abundance accorded well with theoretically ideal figures that are traditionally derived from measurements of relative biomass. Although biovolumetric estimates take the average size of a given organism into consideration, there is no accounting for differences in organismic construction, particularly in regard to the densities and caloric values of different tissue types. There is little benefit in the biovolumetric comparison of gelatinous organisms, for example, with that of arthropods, because their respective compositions are so different. Comparisons of this sort within a closer taxonomic rank (e.g., among just arthropods) might better reflect original biomass proportions, but does

not equal the original nutrient value because of variability between genera (i.e., there is no way to determine 'dry weight' or 'ash-free dry weight'). The same problem arises if comparisons are made using comparable living taxa as proxies for biovolume to biomass conversions or interpretations.

There is no way, at present, to accurately determine the original biomass of fossil organisms. However, there may be some value in the analyses of available data (numerical abundance) and some extrapolation (biovolumetric estimates) if the data are addressed cautiously, and with an understanding of the limits of their significance.

There is progressive improvement in the understanding of Burgess Shale organisms with regard to their feeding strategies and trophic status (Fortey and Owens 1999; Butterfield, in press). Now, with unambiguous evidence of secondary (and probably tertiary) carnivory, Middle Cambrian trophic structure can be analyzed with greater confidence than previous attempts (e.g., Conway Morris 1986).

Of course, taphonomic filtering must still be considered, along with the problems associated with measurements of relative biomass being substituted for numerical abundance and biovolumetric data. Nonetheless, further estimates of energy and nutrient transfer between broadly defined trophic categories, based on new information, may now be approaching intrinsic limits. Departures of these estimates from expected values of about 10 % are discussed below. Although estimates of this kind can be calculated and compared to theoretical optima, the specific meaning of the resulting data becomes even more obscure with the consideration of trophic generalism.

4.5.1 *Primary production to primary consumers*

The paucity of algal remains (only 20 recorded specimens) and the presently unknown component of phytoplankton and bacteria diminishes the value of calculating the transfer efficiency to primary consumers. Of the phytoplankton and bacteria, it may be assumed that their availability was considerable, as there were a substantial number of supposed primary consumers dependent upon them (2939 individuals, including all 'deposit' and suspension feeders; 4074 if *Pollingeria* may be included as well). Since the available evidence for macro-algae alone is insufficient to have supported such large populations of consumers, the bulk of available primary production in the Raymond Quarry fauna *must* have been in the form of phytoplankton and bacteria (unless the taphonomic filtering effects have been grossly underestimated).

4.5.2 *Primary consumers to primary carnivores*

Both primary consumers and primary carnivores are well represented as fossils in the Raymond Quarry fauna. Without adjustments, the number of primary carnivores is slightly higher than the number of primary consumers, yielding a transfer efficiency of about 105 %. This figure is about one order of magnitude higher than the theoretical optimum, and is ecologically impossible. This is due to an incomplete knowledge of the actual trophic status of the constituent organisms, and may indicate a significant taphonomic loss of information as well (i.e., this fauna does not represent a fully constituted ecosystem).

Pollingeria represents the greatest proportion of organisms in the Raymond Quarry fauna that remains trophically unresolved. The entirely speculative addition of

Pollingeria to the primary consumer level reduces the calculated transfer efficiency to about 76 %. Even if this is appropriate, the figure remains highly unrealistic.

There are several possible explanations that may account for the high level of transfer efficiency, despite the proposed adjustment above, if this was not a genuine aspect of the living fauna. Some of the ‘primary carnivores’ may have exploited higher or lower trophic levels, and would be more appropriately described as trophic generalists. Unfortunately, the complete diet is not known for *any* Raymond Quarry organisms and only poorly known for a few. Although a finer resolution of feeding habits of all taxa would be of great value, present evidence does not allow it. There is an additional underlying assumption that the Raymond Quarry faunal community was perfectly discrete, but the amount of potential interaction between this and other contemporaneous communities is not known. Certain taxa are common to many of the Burgess Shale members, despite the fact that each member appears to contain its own distinct fauna.

4.5.3 *Primary carnivores to secondary (+?) carnivores*

Secondary carnivory is confirmed by the identifiable gut contents of the undescribed medusoids. The ‘transparent’ nature of the fossils, imparted by relatively insubstantial tissues in life, allows a unique opportunity to observe ingested prey consisting entirely of soft tissue, including other predatory species. The same trophic level is inferred for the anomalocarids, based on circumstantial evidence of putative predator-inflicted wounds on other predaceous species, such as *Naraoia* (Nedin 1999).

Predictably, the number of individuals in this highest level of carnivory is lower than in any other trophic category. The estimate of transfer efficiency, based on all

known primary to secondary carnivores is about 9 %, while subtraction of the probable scavengers from the primary carnivore group results in an efficiency of about 14 %.

These upper and lower limits of transfer efficiency accord very well with the theoretical optimum, suggesting that this estimate is more accurate than the calculations made for lower trophic levels. Perhaps significantly, these trophically dominant organisms (particularly the medusoids) are among the least ubiquitous in terms of their occurrence in other faunas.

The medusoids were also found to contain *Leancoilia* (a probable scavenger) and hyolithids (probable phytoplankton-feeders), indicating that more than one trophic level was exploited as food. Similarly, it is expected that the larger dinocarids were able to consume a wide variety of non-biomineralized prey (including freshly moulted carnivorous trilobites and phytoplankton-feeding genera like *Helmetia*) belonging to different trophic groups. If secondary carnivores had all other trophic levels available to them as food, then the calculated transfer efficiency drops below 4.5 %. This last scenario may be considered less likely if there was any degree of trophic specialization.

4.6 Biovolumetric estimates of the Raymond Quarry faunal trophic nucleus

Recognizing that the original biomass of flattened fossil impressions of animals is impossible to determine, Conway Morris (1986) made estimates of biovolume for his analyses of the Phyllopod Bed assemblage. Assessing the compatibility of biovolumetric estimates and numerical abundance, he found that priapulid and polychaete data were 'fairly concordant', but the larger arthropods (particularly *Sidneyia*) skewed importance away from the highly populous but rather small *Marrella*. The low diversity of

priapulids in the Raymond Quarry fauna (three genera) and paucity of polychaete fossils renders a similar comparison ineffectual. However, the expanded knowledge of trophic architecture in the Raymond Quarry fauna does allow comparisons to be made between *different* groups of animals within general trophic categories, in regard to numerical abundance and the amount of total space they occupied in their living environment.

Estimates of animal volumes within the trophic nucleus of the whole Raymond Quarry fauna were made in a similar manner as conducted by Conway Morris (1986). Because of differences in animal size between the Phyllopod Bed assemblage and the Raymond Quarry fauna (Devereux et al. 1998), new estimates of volume were made based on an ‘average-sized’ individual of each taxon converted into simple geometric shapes (Table 2 and Appendix III). The resulting individual volume estimates were then used to assess the total volume (i.e., ecological space) occupied by a given taxon. Total biovolumes are discussed below in terms of concordance with numerical abundance, as well as the significance of the degree to which they differ (Table 4). A purely hypothetical adjustment for the inclusion of *Pollingeria* with the primary consumers is also provided.

4.6.1 *Primary consumers*

Without adjustments, the rank-order of importance by numerical abundance and biovolume in the primary consumer trophic category do not accord well with each other. Although *Choia* outnumbers all other members of this trophic category combined, their relatively trivial volume reduces their importance considerably in terms of the total space that they occupied in life. This reversal of importance corresponds to vast size

differences; although larger sponges (taken here to include the chancelloriids) are fewer in number, their size contributed to a greater degree, and they occupied more space overall than the smaller sponges. However, because most of the sponges are essentially hollow cones, the amount of living tissue increased with size to a lesser degree (as a square function) than the total volume (a cube function), thus exaggerating dominance somewhat (in the context of actual biomass). Regardless, the ecological space occupied by the sponges does not appear to have been shared with other organisms, and so the measure of space dominated by a particular sponge may be considered to include the hollow interior. Perhaps more significantly, each sponge in the trophic nucleus of the Raymond Quarry fauna exploited nutritional resources at different heights above the substrate (i.e., there was a tiered division of space). Although their food sources were likely similar, their importance – whether by abundance or by dominance of space – was probably related more closely to nutritional availability at their respective tiers above the sediment. This may be regarded as niche partitioning which lowered levels of direct competition for space as well as nutritional requirements.

Priscansermarinus and *Pagetia* remain relatively low-ranked in the trophic nucleus, whether they are considered in numbers or by total volume.

Speculatively, if *Pollingeria* was a primary consumer, its high rank in terms of numerical abundance (3rd) would be similar to its estimated biovolumetric rank (2nd) in this trophic category.

4.6.2 *Primary carnivores*

The rank-order of importance within the primary carnivores of the whole Raymond Quarry faunal trophic nucleus remains unchanged whether considered by numerical abundance or by biovolumetric estimation. Despite the presence of mostly arthropod taxa in this trophic category, concordance of these data is very high. Conway Morris' (1986) observation of low concordance among arthropods in this regard resulted from great variation in animal size (e.g., between *Marrella* and *Sidneyia*) in the Phyllopod Bed. A similar analogy may be extended to *Choia* within the primary consumers of the Raymond Quarry fauna, but does not apply to this trophic category.

Although there are differences in size (and hence estimated biovolumes) among the trophic nucleus primary carnivores, only *Sidneyia* shows a conspicuous proportional change within its rank as represented by biovolume, since it was the largest genus. This effect is not significant enough to change the rank-order, however, and if organismic construction was similar among these taxa, then some concordance would be expected in consideration of biomass as well.

4.6.3 *Secondary (+?) carnivores*

Only two taxa can be placed within the secondary (or possibly higher) carnivores, based on current information: *Hurdia* and the undescribed medusoids. Both were mobile residents of the pelagic zone, and so measures of dominance by occupation of space as well as potential trophic competition may be significant.

Hurdia is out-ranked by the medusoids in terms of numerical abundance and total estimated biovolume. Although the medusoids occupied more physical space, the high

water content of their bodies (perhaps as high as 99 %) would have translated into very little actual biomass. The original water content of the *Hurdia* body is impossible to determine, but as arthropods (Collins 1996) their stores of proteins, lipids and other organic compounds would have been more richly concentrated than a cnidarian's. As a result, *Hurdia* must have been more important in terms of its impact within the Raymond Quarry faunal ecology, since their total biomass and metabolic requirements would have been higher. Therefore, the ecological dominance of these taxa with respect to each other is not reflected in either numerical abundance or total biovolume.

4.6.4 Summary of concordance

The comparison of numerical abundance and biovolumes among the primary consumers appears to be the least concordant of the trophic categories identified in the Raymond Quarry fauna. The degree to which abundance and dominance of space by a given taxon agree in this category must be considered poor. Discussions of importance must therefore include some consideration of individual animal size, while also recognizing the significance of differences in organismic construction.

Among the primary carnivores of the Raymond Quarry faunal nucleus, numerical abundance and biovolumetric estimates are highly concordant, particularly in regard to rank-order of importance.

Both numerical abundance and biovolumetric estimates skew importance toward the medusoids and away from *Hurdia*. *Hurdia* must have had greater total biomass and therefore a more significant impact on Raymond Quarry ecology.

CHAPTER 5: CONCLUSIONS

5.1 General comments

The collection of Raymond Quarry Member fossils used in this study is ideally suited to the study of Middle Cambrian palaeoecology. The size of the excavation (about 700 m³) and number of fossils collected for study (9006) represents a good sample size. Records were kept with regard to stratigraphic relationships of the fossils, allowing some analysis of associations and changes that occurred in the fauna over time. Notes on lateral distribution were also useful, and provide nearly the equivalent of a transect across the seafloor perpendicular to the Cathedral Escarpment. Exposures of Raymond Quarry-equivalent strata and fossils over an area of several kilometres show that the fauna was not as geographically isolated as the more famous Phyllopod Bed. Additionally, the autochthonous nature of the fossils ensures that the analysis includes only one fauna, and eliminates the need for the consideration of pre- and post-slide environments. Although there is always an element of taphonomic filtering to consider, soft-bodied (i.e., 'Burgess Shale-type') preservation occurs through most of the Raymond Quarry Member, and across a significant spectrum of tissue types.

The revised definition of a trophic nucleus used in this work included about 88 % of individual organisms. An autecological review of these taxa revealed new information with regard to their distribution, life habits, feeding strategy and trophic status.

5.2 Autecological summary of the trophic nucleus

Ottoia was an infaunal organism that moved shallowly and horizontally through the uppermost layers of soft sediment, and did not reside in a U-shaped burrow as suggested in previous literature. *Ottoia* appears to have favoured a dysoxic environment and moulted to accommodate growth -- features common to modern priapulids. However, unlike their contemporary relatives, the animal apparently constructed an organic-walled chamber in which to exuviate. Identifiable gut contents confirm *Ottoia* as a predator of shelly organisms, and circumstantial evidence suggests a soft diet that may have even included pelagic ctenophores.

Choia was a free-living gregarious sponge that flourished in apparently short-lived blooming events. It may have been more susceptible to environmental change than most other characteristic Raymond Quarry taxa.

Pollingeria remains enigmatic. Its tentative assignment to the primary consumer trophic level is entirely hypothetical.

Leancoilia probably scavenged for high-quality detritus (i.e., animal carcasses) using its eyes and its whip-like frontal appendages.

Vauxia exhibited different form as an ecophenotypic response to environmental current flow and sediment loading. The sponge was usually rooted shallowly in the mud but occasionally attached to a harder substrate, such as a brachiopod valve.

Chancelloriids seem to have preferred a more rigid substrate when mature, but may have been passively free-living for a period before settling onto a suitable substrate.

Sidneyia was a predator of shelly and soft organisms. It walked and swam along the muddy bottom, and possessed some adaptations for burrowing as well. However,

there is no evidence that this relatively common animal burrowed in the Raymond Quarry environment.

Priscansermarinus was a sessile filter feeder, perhaps shallowly rooted in the muddy bottom of the Raymond Quarry environment.

Pagetia is thought to be a pelagic genus, but its presence in the feeding burrow of an infaunal organism (*Ottoia*) points to an occasional benthic habit.

The undescribed medusoids are a new taxon that presently represents the oldest known example of a tentaculate medusiform cnidarian in the fossil record. The size and shape of the bell suggests a strong swimming ability. Uniquely, the 'transparent' nature of the fossils permits the identification of soft-bodied prey items, including *Ottoia*. If *Ottoia* preyed upon the putatively carnivorous ctenophores, then the medusoids must be elevated to the tertiary carnivore level.

Hurdia was a fragile animal that broke apart easily upon death. There is no evidence that this swimming predator (or any dinocarid) preyed on biomineralized organisms. Trilobites may have been vulnerable prey only in the brief period following ecdysis.

5.3 Synecological summary of the Raymond Quarry fauna

Intervals of strata in the Raymond Quarry seem to record a complete cycle of arrival, establishment, apex, decline and departure of a discrete community. Changes in faunal composition and diversity seem to reflect a changing environment that included decreased water depth and increased oxygenation. The latter probably contributed significantly to increased taphonomic filtering as well.

A trophic web was created using new information that included secondary and possibly tertiary carnivores. Deposit feeders and macroherbivores are conspicuously absent, and macroalgal forms were rare. The primary productivity of the web remains virtually unknown, but probably consisted largely of phytoplankton and bacteria.

Many of the primary consumers were sessile filter feeding forms, and these showed marked tiering of height above the sediment. Brachiopods, hyolithids and the sponge *Choia* occupied low tiers (<1 cm). Medium tiers (1 -- 10 cm) were mostly occupied by a variety of sponges. High tiers (>10 cm) were occupied by *Echmatocrinus*, *Leptomitrus* and *Mackenzia*. The latter genus attained a height above the sediment of at least 28 cm. This effectively triples previously published estimates of epibenthic tiering height for Cambrian communities.

Primary carnivores included *Ottoia*, a wide variety of arthropods, and ctenophores. In some cases, these taxa contained identifiable shelly food items within their guts, but in all cases the soft-bodied diet remains unknown.

Secondary (and higher?) carnivores included *Hurdia* (and other dinocarids), and undescribed medusoids. All were active swimmers, but only the medusoids appear to have consumed biomineralizing prey.

Estimates of energy and nutrient transfer efficiency between broad trophic categories, based on numerical abundance, accorded poorly with the theoretical optimum (10 %), except perhaps between the highest levels of carnivory.

A comparison between biovolumetric and numerical dominance of taxa in the trophic nucleus shows little agreement in the rank order of primary consumers, but complete agreement within all carnivores. Both measures are potentially misleading,

however. Since actual biomass cannot be determined for fossil organisms, numerical abundance, size, and organismic construction must be considered together in order to interpret data of this kind.

BIBLIOGRAPHY

- Aitken, J.D. 1989. Birth, growth and death of the Middle Cambrian Cathedral carbonate lithosome, Southern Rocky Mountains. *Bulletin of Canadian Petroleum Geology* 37(3): 316-333.
- Aitken, J.D., and McIlreath, I.A. 1984. The Cathedral Reef Escarpment: a Cambrian great wall with humble origins. *Geos* 13(1): 17-19.
- Allison, P.A. 1986. Soft-bodied animals in the fossil record: the role of decay in fragmentation during transport. *Geology* 14: 979-981.
- Allison, P.A., and Brett, C.E. 1995. In situ benthos and paleo-oxygenation in the Middle Cambrian Burgess Shale, British Columbia, Canada. *Geology* 23(12): 1079-1082.
- Ausich, W.I., and Babcock, L.E. 2000. *Echmatocrinus*, a Burgess Shale animal reconsidered. *Lethaia* 33: 92-94.
- Ausich, W.I., and Bottjer, D.J. 1982. Tiering in suspension-feeding communities on soft substrata throughout the Phanerozoic. *Science* 216: 173-174.
- Babcock, L.E., and Robison, R.A. 1989. Preferences of Palaeozoic predators. *Nature* 337: 695-696.
- Bambach, R.K. 1983. Ecospace utilization and guilds in marine communities through the Phanerozoic, in Tevesz, M.J.S. and McCall, P.L. (eds.) *Biotic Interactions in Recent and Fossil Benthic Communities*, Plenum Press, New York: pp. 719-746.
- Barnes, R.D. 1987. *Invertebrate Zoology* (5th Ed.) Saunders College Publishing, Fort Worth. 893 pp.
- Benton, M.J., Wills, M.A., and Hitchin, R. 2000. Quality of the fossil record through time. *Nature* 403: 534-537.
- Briggs, D.E.G. 1976. The arthropod *Branchiocaris* n.gen., Middle Cambrian, Burgess Shale, British Columbia. *Geological Survey of Canada Bulletin* 264: 1-29.
- Briggs, D.E.G. 1981. The arthropod *Odaraia alata* Walcott, Middle Cambrian, Burgess Shale, British Columbia. *Philosophical Transactions of the Royal Society of London B* 291: 541-584.
- Briggs, D.E.G., and Collins, D.H. 1999. The arthropod *Alalcomenaeus cambricus* Simonetta, from the Middle Cambrian Burgess Shale of British Columbia. *Palaeontology* 42(6): 953-977.

- Briggs, D.E.G., and Mount, J.D. 1982. The occurrence of the giant arthropod *Anomalocaris* in the Lower Cambrian of southern California, and the overall distribution of the genus. *Journal of Paleontology* 56(5): 1112-1118.
- Briggs, D.E.G., and Robison, R.A. 1984. Exceptionally preserved nontrilobite arthropods and *Anomalocaris* from the Middle Cambrian of Utah. *University of Kansas Paleontological Contributions* 111: 1-24.
- Briggs, D.E.G., and Whittington, H.B. 1985. Modes of life of arthropods from the Burgess Shale, British Columbia. *Transactions of the Royal Society of Edinburgh, Earth Sciences* 76: 149-160.
- Briggs, D.E.G., and Whittington, H.B. 1987. The affinities of the Cambrian animals *Anomalocaris* and *Opabinia*. *Lethaia* 20: 185-186.
- Bruton, D.L. 1981. The arthropod *Sidneyia inexpectans*, Middle Cambrian, Burgess Shale, British Columbia. *Philosophical Transactions of the Royal Society of London B* 295: 619-653.
- Bruton, D.L. 1991. Beach and laboratory experiments with the jellyfish *Aurelia* and remarks on some fossil "medusoid" traces. In Simonetta, A.M., and Conway Morris, S. (eds.) *The early evolution of Metazoa and the significance of problematic taxa*. Cambridge University Press, Cambridge: pp. 125-129.
- Bruton, D.L., and Whittington, H.B. 1983. *Emeraldella* and *Leancoilia*, two arthropods from the Burgess Shale, Middle Cambrian, British Columbia. *Philosophical Transactions of the Royal Society of London B* 300: 553-585.
- Bruton, D.L., Jensen, A., and Jacquet, R. 1985. The use of models in the understanding of Cambrian arthropod morphology. *Transactions of the Royal Society of Edinburgh, Earth Sciences* 76: 365-369.
- Butterfield, N.J. 1990. Organic preservation of non-mineralizing organism and the taphonomy of the Burgess Shale. *Paleobiology* 16(3): 272-286.
- Butterfield, N.J. 1994. Burgess Shale-type fossils from a Lower Cambrian shallow-shelf sequence in northwestern Canada. *Nature* 369: 477-479.
- Butterfield, N.J. 1995. Secular distribution of Burgess-Shale-type preservation. *Lethaia* 28: 1-13.
- Butterfield, N.J., and Nicholas, C.J. 1996. Burgess Shale-type preservation of both non-mineralizing and 'shelly' Cambrian organisms from the Mackenzie Mountains, northwestern Canada. *Journal of Paleontology* 70(6): 893-899.

- Cao, Y., Williams, D.D., and Williams, N.E. 1998. How important are rare species in aquatic community ecology and bioassessment? *Limnology and Oceanography* 43(7): 1403-1409.
- Caron, J.-B. 1999. The problematic animal, *Banffia constricta*, Burgess Shale, Middle Cambrian, British Columbia, Canada. Unpublished dissertation, Universite Claude Bernard - Lyon, France.
- Chaunas, B., and Pawlik, J.R. 1996. Does the skeleton of a sponge provide a defense against predatory reef fish? *Oecologia* 107: 225-231.
- Chen, J.-Y., Ramskold, L., and Zhou, G.-Q. 1994. Evidence for arthropod affinity of Cambrian giant predators. *Science* 264: 1304-1308.
- Chen, J.-Y., Zhu, M.-Y., and Zhou, G.-Q. 1995. The Early Cambrian medusiform metazoan *Eldonia* from the Chengjiang *Lagerstätte*. *Acta Paleontologica Polonica* 40(3): 213-244.
- Collins, A.G., Lipps, J.H., and Valentine, J.W. 1998. Flatworm and anemone traces are comparable to some trace fossils of the Neoproterozoic. (Abs.) Geological Society of America, Abstracts with Programs 30(7): A385.
- Collins, D.H. 1996. The "evolution" of *Anomalocaris* and its classification in the arthropod Class Dinocarida (Nov.) and Order Radiodonta (Nov.). *Journal of Paleontology* 70(2): 280-293.
- Collins, D.H. 1996. The *Leanchoilia* - *Ottoia* fauna from the Middle Cambrian Burgess Shale of British Columbia. (Abs.) Paleontological Society Special Publication No. 8: 77.
- Collins, D.H., and Rudkin, D.M. 1981. *Priscansermarinus barnetti*, a probable lepadomorph barnacle from the Middle Cambrian Burgess Shale of British Columbia. *Journal of Paleontology* 55(5): 1006-1015.
- Collins, D.H., Briggs, D.E.G., and Conway Morris, S. 1983. New Burgess Shale fossil sites reveal Middle Cambrian faunal complex. *Science* 222: 163-167.
- Conway Morris, S. 1976. *Nectocaris pteryx*, a new organism from the Middle Cambrian Burgess Shale of British Columbia. *Neues Jahrbuch für Geologie und Palaeontology, Monatshefte* 12: 705-713.
- Conway Morris, S. 1977a. Fossil priapulid worms. *Special Papers in Palaeontology* 20: 1-95.
- Conway Morris, S. 1978. *Laggania cambria* Walcott: a composite fossil. *Journal of Paleontology* 52(1): 126-131.

- Conway Morris, S. 1979. Middle Cambrian polychaetes from the Burgess Shale of British Columbia. *Philosophical Transactions of the Royal Society of London B* 285: 227-274.
- Conway Morris, S. 1985. Cambrian *Lagerstätten*: their distribution and significance. *Philosophical Transactions of the Royal Society of London B* 311: 49-65.
- Conway Morris, S. 1986. The community structure of the Middle Cambrian Phyllopod Bed (Burgess Shale). *Palaeontology* 29(3): 423-467.
- Conway Morris, S. 1989. The persistence of Burgess Shale-type faunas: implications for the evolution of deeper-water faunas. *Transactions of the Royal Society of Edinburgh, Earth Sciences* 80: 271-283.
- Conway Morris, S. 1993. Ediacaran-like fossils in Cambrian Burgess Shale-type faunas of North America. *Palaeontology* 36(3): 593-635.
- Conway Morris, S. 1997. The cuticular structure of the 495-Myr-old type species of the fossil worm *Palaeoscolex*, *P. piscalerum* (?Priapulida). *Zoological Journal of the Linnean Society* 119: 69-82.
- Conway Morris, S., and Collins, D.H. 1996. Middle Cambrian ctenophores from the Stephen Formation, British Columbia, Canada. *Philosophical Transactions of the Royal Society of London B* 351: 279-308.
- Conway Morris, S., and Jenkins, R.J.F. 1985. Healed injuries in Early Cambrian trilobites from South Australia. *Alcheringa* 9: 167-177.
- Conway Morris, S., and Robison, R.A. 1988. More soft-bodied animals and algae from the Middle Cambrian of Utah and British Columbia. *University of Kansas Paleontological Contributions* 122: 1-48.
- Conway Morris, S., and Whittington, H.B. 1985. Fossils of the Burgess Shale - a treasure in Yoho National Park, British Columbia. *Geological Survey of Canada Miscellaneous Report* 43: 1-31.
- Conway Morris, S., Peel, J.S., Higgins, A.K., Soper, N.J., and Davis, N.C. 1987. A Burgess Shale-like fauna from the Lower Cambrian of north Greenland. *Nature* 326: 181-183.
- Copeland, M.J. 1993. *Anomalocaris* (of unknown affinity) and *Tuzoia* (a possible arthropod) from the Lower Cambrian Eager Formation near Cranbrook, British Columbia. *Bulletin of the Geological Survey of Canada* 444: 1-5.

- Dauwe, B., Herman, P.M.J., and Heip, C.H.R. 1998. Community structure and bioturbation potential of macrofauna at four North Sea stations with contrasting food supply. *Marine Ecology Progress Series* 173: 67-83.
- Delle Cave, L., and Simonetta, A.M. 1975. Notes on the morphology and taxonomic position of *Aysheaia* (Onychophora?) and of *Skania* (undetermined phylum). *Monitore Zoologica Italica* 9: 67-81.
- Deverereux, M., Collins, D.H., and Butterfield, N.J. 1998. Sedimentological and palaeoecological comparison of the Raymond Quarry and Walcott Quarry assemblages, Burgess Shale.(Abs.) Geological Society of America, Abstracts with Programs 30(7): A234.
- Dodd, J.R., and Stanton, R.J., Jr. 1990. *Paleoecology, Concepts and Applications* (2nd Ed.). John Wiley & Sons, New York. 502 pp.
- Fedonkin, M.A. 1992. Vendian faunas and the early evolution of metazoa. In Lipps, J.H., and Signor, P.W. (eds.) *Origin and Early Evolution of the Metazoa*. Plenum Press, New York: pp. 87-129.
- Fletcher, T.P., and Collins, D.H. 1998. The Middle Cambrian Burgess Shale and its relationship to the Stephen Formation in the southern Canadian Rocky Mountains. *Canadian Journal of Earth Sciences* 35: 413-436.
- Fortey, R.A., and Owens, R.M. 1999. Feeding habits in trilobites. *Palaeontology* 42(3): 429-465.
- Fritz, W.H. 1969. Geological setting of the Burgess Shale. *Proceedings of the North American Paleontological Convention, Part I*: 1155-1170.
- Fritz, W.H. 1990. Comment: In defence of the Escarpment near the Burgess Shale fossil locality. *Geoscience Canada* 17(2): 106-110.
- Gili, J.-M., and Coma, R. 1998. Benthic suspension feeders: their paramount role in littoral marine food webs. *Trends in Ecology and Evolution* 13(8): 316-321.
- Glaessner, M.F. 1979. Lower Cambrian Crustacea and annelid worm from Kangaroo Island, South Australia. *Alcheringa* 3: 21-31.
- Glaessner, M.F. 1984. *The Dawn of Animal Life: A Biohistorical Study*. Cambridge University Press, Cambridge: 244 pp.
- Goryansky, V. Yu. 1973. O neobkhodimosti isklucheniya roda *Chancelloria* Walcott iz tipa gubok. [On the necessity of exclusion of *Chancelloria* Walcott from the phylum Porifera.] *Trudy Institute Geologia; Geofizika Sibirskoye Otdeieniye* 49: 34-44. [in Russian]

- Gould, S.J. 1989. Wonderful Life: the Burgess Shale and the nature of history. W.W. Norton & Company, New York: pp. 347.
- Henriksen, K.L. 1928. Critical notes upon some Cambrian arthropods described by Charles D. Walcott. Videnskabelige Meddelelser fra Dansk Naturhistorisk Forening: Kbhobenhavn 86: 1-20.
- Hou, X.-G., Bergstrom, J., and Ahlberg, P. 1995. *Anomalocaris* and other large animals in the Lower Cambrian Chengjiang fauna of southwest China. GFF 117(3): 163-183.
- Hou, X.-G., Bergstrom, J., and Ahlberg, P. 1995. *Anomalocaris* and other large animals in the Lower Cambrian of southwest China. Geologiske Föreningens; Stockholm Forhandlingar 117: 163-183.
- Hou, X.-G., Chen, J.-Y., and Lu, H.-Z. 1989. Early Cambrian new arthropods from Chengjiang, Yunnan. Acta Palaeontologica Sinica 28(1): 53-68.
- Hou, X.-G., Ramsköld, L., and Bergstrom, J. 1991. Composition and preservation of the Chengjiang fauna - a Lower Cambrian soft-bodied biota. Zoologica Scripta 20: 395-411.
- Hyman, L.H. 1940. The Invertebrates: Protozoa through Ctenophora (Vol. 1). McGraw-Hill Book Co. Ltd., New York: 726 pp.
- Janssen, H.H., and Oeschger, R. 1992. The body wall of *Halicryptus spinulosus* (Priapulida): Ultrastructure and changes induced by hydrogen sulphide. Hydrobiologia 230 (3): 219-230.
- Jell, P.A. 1975. Australian Middle Cambrian eodiscoids, with a review of the superfamily. Palaeontographica A 150: 1-97.
- Jell, P.A. 1983. A large bivalve arthropod from South Australian Department of Mines and Energy Edeowai-1 well of probable Cambrian age. Transactions of the Royal Society of South Australia 107(1-2): 123-126.
- Lang, K. 1948. Contribution to the ecology of *Priapulius caudatus* Lam. Arkiv For Zoologi 41A (5): 1-12.
- Lawton, J.H. 1990. Species richness and population dynamics of animal assemblages. Patterns in body size: abundance space. Philosophical Transactions of the Royal Society of London B 330: 283-291.
- Ludvigson, R. 1989. The Burgess Shale: Not in the shadow of the Cathedral Escarpment. Geoscience Canada 16: 51-59.

- Ludvigson, R. 1990. Reply to comments by Fritz, Aitken and McIlreath. *Geoscience Canada* 17: 116-118.
- Mankiewicz, C. 1992. *Obruchevella* and other microfossils in the Burgess Shale: preservation and affinity. *Journal of Paleontology* 66(5): 717-729.
- Marek, L. and Yochelson, E.L. 1976. Aspects of the biology of *Hyolitha* (Mollusca). *Lethaia* 9: 65-82.
- Marek, L., Parsely, R.L., and Galle, A. 1997. Functional morphology of hyoliths based on flume studies. *Vestník Ceskeho Geologického Ustavu* 72(4): 351-358.
- Marek, L., Parsley, R.L., and Galle, A. 1997. Functional morphology of hyoliths based on flume studies. *Vestník Ceskeho Geologického Ustavu* 72(4): 351-358.
- McHenry, R., and Yates, A. 1993. First report of the enigmatic metazoan *Anomalocaris* from the southern hemisphere and a trilobite with preserved appendages from the early Cambrian of Kangaroo Island, South Australia. *Records of the South Australia Museum* 26(2): 77-86.
- McIlreath, I.A. 1977. Accumulation of a Middle Cambrian, deep-water limestone debris apron adjacent to a vertical submarine carbonate escarpment, southern Rocky Mountains, Canada. *Society of Economic Paleontologists and Mineralogists, Special Publication No. 25*: 113-124.
- Meglitsch, P.A., and Schram, F.R. 1991. *Invertebrate Zoology* (3rd Ed.). Oxford University Press, New York: 623 pp.
- Mierzejewski, P. 1986. Ultrastructure, taxonomy and affinities of some Ordovician and Silurian organic microfossils. *Palaeontologia Polonica* 0(47): 129-220.
- Murray, B.R., Rice, B.L., Keith, D.A., Myerscough, P.J., Howell, J., Floyd, A.G., Mills, K., and Westoby, M. 1999. Species in the tail of rank-abundance curves. *Ecology* 80(6): 1806-1816.
- Nedin, C. 1999. *Anomalocaris* predation on nonmineralized and mineralized trilobites. *Geology* 27(11): 987-990.
- Oeschger, R. 1990. Long-term anaerobiosis in sublittoral marine invertebrates from the Western Baltic Sea: *Halicryptus spinulosis* (Priapulida), *Astarte borealis* and *Arctica islandica* (Bivalvia). *Marine Ecology Progress Series* 59: 133-143.
- Oeschger, R. and Vetter, R.D. 1992. Sulphide detoxification and tolerance in *Halicryptus spinulosis* (Priapulidae): a multiple strategy. *Marine Ecology Progress Series* 86: 167-179.

- Oeschger, R., and Janssen, H.H. 1991. Histological studies on *Halicryptus spinulosus* (Priapulida) with regard to environmental hydrogen sulphide resistance. *Hydrobiologia* 222: 1-12.
- Oeschger, R., Peper, H., Graf, G., and Theede, H. 1992. Metabolic responses of *Halicryptus spinulosus* (Priapulida) to reduced oxygen levels and anoxia. *Journal of Experimental Marine Biology and Ecology* 162: 229-241.
- Orr, P.J., Briggs, D.E.G., and Kearns, S.L. 1998. Cambrian Burgess Shale animals replicated in clay minerals. *Science* 281: 1173-1175.
- Owen, A.W. 1985. Trilobite abnormalities. *Transactions of the Royal Society of Edinburgh* 76: 255-272.
- Pawlik, J.R. 1983. A sponge-eating worm from Bermuda: *Branchiosyllis oculata* (Polychaeta, Syllidae). *Marine Ecology* 4(1): 65-79.
- Piper, D.J.W. 1972. Sediments of the Middle Cambrian Burgess Shale, Canada. *Lethaia* 5: 169-175.
- Polis, G.A., and Strong, D.R. 1996. Food web complexity and community dynamics. *The American Naturalist* 147(5): 813-846.
- Price, R.A. 1967. Operation Bow-Athabasca, Alberta and British Columbia. *Canadian Geological Society Paper* 67(1A): 106-112.
- Raymond, P.E. 1930. Report on invertebrate paleontology. Annual Report of the Director of the Museum of Comparative Zoology at Harvard College to the President and fellows of Harvard College for 1929-1930: pp. 31-33.
- Raymond, P.E. 1935. *Leancoilia* and other Mid-Cambrian Arthropoda. *Bulletin of the Museum of Comparative Zoology (Harvard College)* 76(6): 205-230.
- Reiswig, H.M. 1971. Particle feeding in natural populations of three marine demosponges. *Biological Bulletin* 141(3): 568-591.
- Reiswig, H.M. 1981. Partial carbon and energy budgets of the bactriosponge *Verongia fistularis* (Porifera: Demospongiae) in Barbados. *Marine Ecology* 2(4): 273-293.
- Rigby, J.K. Sr. 1978. Porifera of the Middle Cambrian Wheeler Shale, from the Wheeler Amphitheater, House Range, in western Utah. *Journal of Paleontology* 52(6): 1325-1345.

- Rigby, J.K. Sr. 1980. The new Middle Cambrian sponge *Vauxia magna* from the Spence Shale of northern Utah and taxonomic position of the Vauxiidae. *Journal of Paleontology* 54(1): 234-240.
- Rigby, J.K. Sr. 1981. Cambrian sponges of the North American Cordilleran region. United States Geological Survey, Open File Report 81-743: 181-183.
- Rigby, J.K. Sr. 1983. Sponges of the Middle Cambrian Marjum Limestone from the House Range and Drum Mountains of western Millard County, Utah. *Journal of Paleontology* 57(2): 240-270.
- Rigby, J.K. Sr. 1986. Sponges of the Burgess Shale (Middle Cambrian), British Columbia. *Palaeontographica Canadiana* No. 2: 1-105.
- Robison, R.A. 1972. Hypostoma of agnostid trilobites. *Lethaia* 5: 239-248.
- Robison, R.A., and Richard, B.C. 1981. Large bivalve arthropods from the Middle Cambrian of Utah. *University of Kansas Paleontological Contributions* 106: 1-28.
- Rolfe, W.D.I. 1962. Two new arthropod carapaces from the Burgess Shale (Middle Cambrian) of Canada. *Breviora* 160: 1-9.
- Root, R.B. 1967. The niche exploitation pattern of the blue-grey gnatcatcher. *Ecological Monographs* 37: 317-350.
- Rudkin, D.M. 1979. Healed injuries in *Ogygopsis klotzi* (Trilobita) from the Middle Cambrian of British Columbia. *Royal Ontario Museum Life Sciences Occasional Paper* No. 32: 1-8.
- Rudkin, D.M. 1985. Exoskeleton abnormalities in four trilobites. *Canadian Journal of Earth Sciences* 22: 479-483.
- Rudkin, D.M. 1992. A possible archaeopriapulid trace fossil from the Middle Cambrian Stephen Formation, British Columbia. *Paleontological Society Special Publication* No. 6: p. 255.
- Scotese, C.R., and McKerrow, W.S. 1990. Revised world maps and introduction. In McKerrow, W.S., and Scotese, C.R. (eds.). *Palaeozoic palaeogeography and biogeography*. *Memoir of the Geological Society*, London 12: 1-435.
- Sdzuy, K. 1969. Unter - und mittelkambrische Porifera (Chancellorida und Hexactinellida). *Paleontologische Zeitschrift* 43: 115-147.
- Sepkoski, J.J. Jr., Bambach, R.K., Raup, D.M., and Valentine, J.W. 1981. Phanerozoic marine diversity and the fossil record. *Nature* 293: 435-437.

- Sepkoski, J.J., Jr. 1981. A factor analytic description of the Phanerozoic marine fossil record. *Paleobiology* 7: 36-53.
- Shapeero, W.L. 1962. The epidermis and cuticle of *Priapulus caudatus* Lamarck. *Transactions of the American Microscopical Society* 81: 352-355.
- Shirley, T.C. 1990. Ecology of *Priapulus caudatus* Lamarck, 1816 (Priapulida) in an Alaskan subarctic ecosystem. *Bulletin of Marine Science* 41(1): 149-158.
- Shu, D.-G., Zhang, X.-L., and Geyer, G. 1995. Anatomy and systematic affinities of the Lower Cambrian bivalved arthropod *Isoxys auritus*. *Alcheringa* 19: 333-342.
- Simonetta, A.M. 1963. Osservazioni: sugli artropodi non trilobiti della Burgess Shale (Cambriano medio). II. Contributo: I Generi *Sidneya* [sic] ed *Amiella* Walcott 1911. *Monitore Zoologico Italiano* 70: 97-108.
- Simonetta, A.M. 1970. Studies on non-trilobite arthropods of the Burgess Shale (Middle Cambrian). *Palaeontographica Italica* 66: 35-45.
- Simonetta, A.M. 1975. The Cambrian non-trilobite arthropods from the Burgess Shale of British Columbia - a study of their comparative morphology, taxonomy [sic] and evolutionary significance. *Palaeontographica Italica* 69: 1-37.
- Siveter, D.J., and Williams, M. 1997. Cambrian bradoriid and phosphatocopid arthropods of North America. *Special Papers in Palaeontology*, Palaeontological Association, London 57: 1-61.
- Sprinkle, J., and Collins, D.H. 1998. Revision of *Echmatocrinus* from the Middle Cambrian Burgess Shale of British Columbia. *Lethaia* 31: 269-282.
- Srivastava, D.S., and Lawton, J.H. 1998. Why more productive sites have more species: an experimental test of theory using tree-hole communities. *The American Naturalist* 152(4): 509-529.
- Staff, G.M., Stanton, R.J. Jr., Powell, E.N., and Cummins, H. 1986. Time-averaging, taphonomy, and their impact on paleocommunity reconstruction: death assemblages in Texas bays. *Geological Society of America Bulletin* 97: 428-443.
- Stanton, R.J. (Jr.), and Dodd, J.R. 1976. The application of trophic structure of fossil communities in paleoenvironmental reconstruction. *Lethaia* 9: 327-342.
- Stanton, R.J., and Nelson, P.C. 1980. Reconstruction of the trophic web in paleontology: community structure in the Stone City Formation (Middle Eocene, Texas). *Journal of Paleontology* 54: 118-135.

- Storch, V., and Alberti, G. 1985. Ultrastructural investigation of the integument of *Tubiluchus philippinensis* (Priapulida, Tubiluchidae). *Zoologica Scripta* 14(4): 265-272.
- Storch, V., Higgins, R.P., and Morse, M.P. 1989. Ultrastructure of the body wall of *Meiopriapulius fijiensis* (Priapulida). *Transactions of the American Microscopical Society* 108(4): 319-331.
- Strong, D.R. 1997. Quick indirect interactions in intertidal food webs. *Trends in Ecology and Evolution* 12(5): 173-174.
- Sun, W.-G., and Hou, X.-G. 1987. Early Cambrian medusae from Chengjiang, Yunnan, China. *Acta Palaeontologica Sinica* 26(3): 268-279.
- Tamm, S., and Tamm, S.L. 1995. A giant nerve net with multi-effector synapses underlying epithelial adhesive strips in the mouth of *Beroe* (Ctenophora). *Journal of Neurocytology* 24(9): 711-723.
- Tamm, S.L., and Tamm, S. 1991. Reversible epithelial adhesion closes the mouth of *Beroe*, a carnivorous marine jelly. *Biological Bulletin (Woods Hole)* 181(3): 463-473.
- Trott, T.J. 1998. Gustatory responses of *Priapulius caudatus* Lamarck, 1816 (Priapulida, Priapulidae): feeding behavior and chemoreception by a living fossil. *Marine Behavior and Physiology* 31(4): 251-257.
- Van Der Land, J. 1970. Systematics, zoogeography and ecology of the Priapulida. *Zoologische Verhandelingen* 112: 1-118.
- Vannier, J., and Chen, J.-Y. 2000. The Early Cambrian colonization of pelagic niches exemplified by *Isoxys* (Arthropoda). *Lethaia* 33: 295-311.
- Verity, P.G., and Smetacek, V. 1996. Organism life cycles, predation, and the structure of marine pelagic ecosystems. *Marine Ecology Progress Series* 130: 277-293.
- Walcott, C.D. 1908. Mount Stephen rocks and fossils. *Canadian Alpine Journal* 1(2): 232-248.
- Walcott, C.D. 1911a. Cambrian geology and paleontology II: Middle Cambrian Merostomata. *Smithsonian Miscellaneous Collections* 57(2): 17-40.
- Walcott, C.D. 1911b. Cambrian geology and paleontology II: Middle Cambrian holothurians and Medusae. *Smithsonian Miscellaneous Collections* 57(3): 41-68.
- Walcott, C.D. 1911c. Cambrian geology and paleontology II: Middle Cambrian annelids. *Smithsonian Miscellaneous Collections* 57(5): 109-144.

- Walcott, C.D. 1912a. Cambrian geology and paleontology II: Middle Cambrian Branchiopoda, Malacostraca, Trilobita and Merostomata. Smithsonian Miscellaneous Collections 57(6): 145-228.
- Walcott, C.D. 1912b. Cambrian of the Kicking Horse Valley, British Columbia. Summary Report, Geological Survey Branch, Department of Mines, Canada, Sessional Paper 26: 188-191.
- Walcott, C.D. 1918. Cambrian geology and paleontology IV: Appendages of trilobites. Smithsonian Miscellaneous Collections 67(4): 115-216.
- Walcott, C.D. 1919. Cambrian geology and paleontology IV: Middle Cambrian algae. Smithsonian Miscellaneous Collections 67(5): 217-260.
- Walcott, C.D. 1920. Cambrian geology and paleontology IV: Middle Cambrian Spongiae. Smithsonian Miscellaneous Collections 67(6): 261-364.
- Walcott, C.D. 1931. Addenda to descriptions of Burgess Shale Fossils (Posthumous, with explanatory notes by Charles E. Resser). Smithsonian Miscellaneous Collections 85(3): 1-46.
- Whiteaves, J.F. 1892. Description of a new Genus and Species of phyllocarid Crustacea from the Middle Cambrian of Mount Stephen, B.C. Canadian Record of Science 5(4): 205-208.
- Whittington, H.B. 1971. The Burgess Shale: history of research and preservation of fossils. Proceedings of the North American Paleontological Convention, Chicago 1: 1170-1201.
- Whittington, H.B. 1975. The enigmatic animal *Opabinia regalis*, Middle Cambrian, Burgess Shale, British Columbia. Philosophical Transactions of the Royal Society of London B 271: 1-43.
- Whittington, H.B. 1977. The Middle Cambrian trilobite *Naraoia*, Burgess Shale, British Columbia. Philosophical Transactions of the Royal Society of London B 280: 409-443.
- Whittington, H.B. 1980b. Exoskeleton, moult stage, appendage morphology and habits of the Middle Cambrian trilobite *Olenoides serratus*. Palaeontology 23(1): 171-204.
- Whittington, H.B. 1981. Rare arthropods from the Burgess Shale, Middle Cambrian, British Columbia. Philosophical Transactions of the Royal Society of London B 292: 329-357.
- Whittington, H.B. 1985. The Burgess Shale. Yale University Press, New Haven: 151 pp.

- Whittington, H.B., and Briggs, D.E.G. 1982. A new conundrum from the Middle Cambrian Burgess Shale. Third North American Paleontological Convention, Proceedings 2: 573-575.
- Whittington, H.B., and Briggs, D.E.G. 1985. The largest Cambrian animal, *Anomalocaris*, Burgess Shale, British Columbia. Philosophical Transactions of the Royal Society of London B 309: 569-609.
- Williams, M., Siveter, D.J., and Peel, J.S. 1996. Isoxys (Arthropoda) from the Early Cambrian Sirius Passet *Lagerstätte*, north Greenland. Journal of Paleontology 70(6): 947-954.
- Wills, M.A. 1998. Cambrian and Recent disparity: the picture from priapulids. Paleobiology 24(2): 177-199.
- Wu, R.S.S., and Shin, P.K.S. 1997. Sediment characteristics and colonization of soft-bottom benthos: a field manipulation experiment. Marine Biology 128: 475-487.
- Yochelson, E.L. 1961. The operculum and mode of life of *Hyolithes*. Journal of Paleontology 35(1): 152-161.

ACKNOWLEDGEMENTS

I wish to thank the field crew members for the Royal Ontario Museum (ROM) expeditions to the Burgess Shale. They excavated at least 700 m³ of rock (1.8 million kilograms or so) in Raymond's Quarry (1991, 1992, 1993 and 1997). A conservative estimate of more than 17 thousand man-hours were devoted to collecting the fossils.

I specifically thank Des Collins for giving me the opportunity to collect and work with the best fossils in the world.

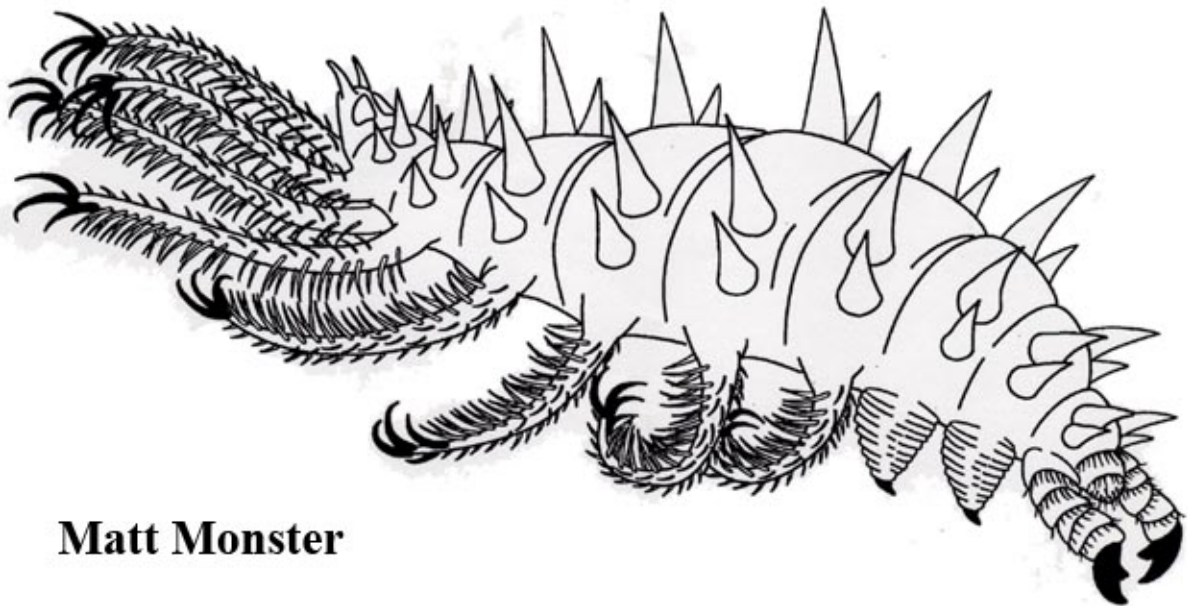
I am grateful to Nick Butterfield, who suggested that I pursue graduate studies and provided financial support.

Natalie Devereux typed many pages of my early hand-written drafts. Denis Tetreault stayed up late on several occasions, helping me to type references and organize photographic figures. Cam Tsujita and Mike Kreitner also expertly assisted in the production of some figures. Jean-Bernard Caron provided some bedding thickness data, and Ewan Laurie helped determine excavation pit sizes. Dave Rudkin, Pete Fenton, Janet Waddington, Brian Iwama, and Joan Burke were always helpful during visits to the ROM. Jisuo Jin generously allowed me to use his digital camera for photography.

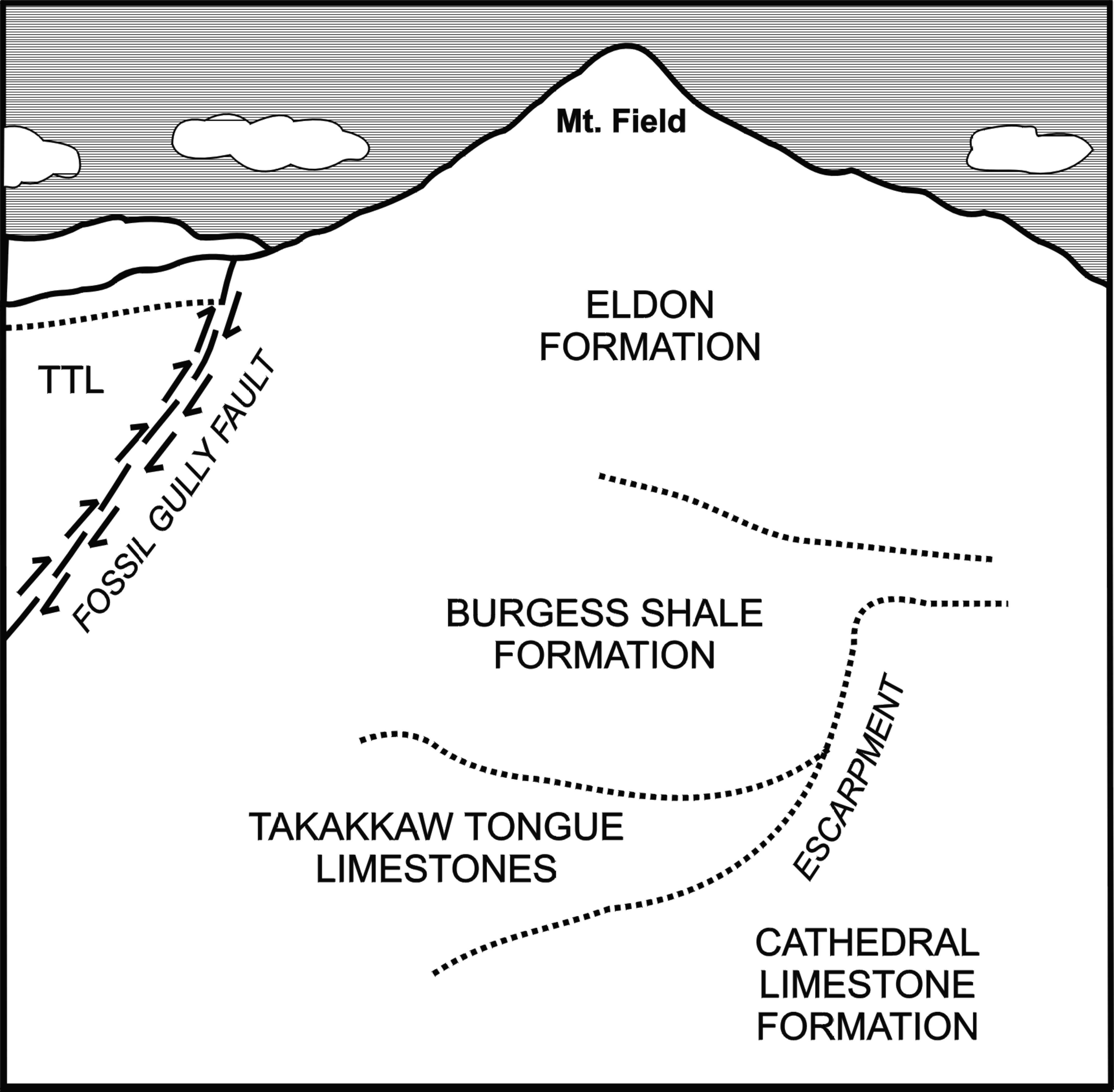
I thank my many friends in the Earth Sciences department at Western for companionship, ideas, and many round-table discussions at the 'Thinking Place'.

Finally, and most warmly of all, I thank my family for love and support. My wife Natalie put up with too many summer-long field seasons and winter-long discussions of the Burgess Shale. I could not have done this without her encouragement and affection.

I dedicate this thesis to my son, Nathan.



Matt Monster



Mt. Field

ELDON
FORMATION

TTL

FOSSIL GULLY FAULT

BURGESS SHALE
FORMATION

TAKAKKAW TONGUE
LIMESTONES

ESCARPMENT

CATHEDRAL
LIMESTONE
FORMATION

APPENDIX I: Life habits and feeding strategies of Raymond faunal taxa

1. agnostids – pelagic swimming filter-feeders (Robison 1972)
2. *Alalcomenaeus* – benthic/nektobenthic predator (Briggs and Collins 1999)
3. *Anomalocaris* – pelagic swimming predator (Whittington and Briggs 1985)
4. *Banffia* – benthic burrowing (?) 'deposit'-feeder (Caron 1999)
5. *Branchiocaris* – pelagic swimming scavenger (Briggs 1976)
6. *Byronia* – sessile, attached filter-feeder (?) (Mierzejewski 1986)
7. *Cambrorhytium* – sessile, attached (?) filter-feeder (Conway Morris 1986b)
8. *Canadaspis* – nektobenthic scavenger/predator (?) (Briggs 1978)
9. *Carnarvonia* – unknown habits
10. Chancelloriids – sessile, attached filter-feeders (Walcott 1920)
11. *Chancia* – benthic vagrant carnivore (?) (e.g., Fortey and Owens 1999)
12. *Choia* – sessile, unattached filter-feeder (Rigby 1986)
13. “Creeposaurus” – unknown habits
14. *Crumillosporgia* – sessile, attached filter-feeders (Rigby 1983)
15. *Ctenorhabdotus* – pelagic swimming predator (Conway Morris and Collins 1996)
16. “Darth Vader” – unknown habits
17. *Echmatocrinus* – sessile attached filter-feeder (Sprinkle 1973)
18. *Elrathina* – benthic vagrant carnivore (?) (e.g., Fortey and Owens 1999)
19. *Emeraldella* – benthic vagrant carnivore/scavenger (Bruton and Whittington 1983)
20. *Gogia* – sessile attached filter-feeder (Sprinkle 1973)
21. ‘*Habelia*’ *brevicauda* – nektobenthic carnivore/scavenger (Simonetta 1964)
22. *Habelia* – benthic vagrant scavenger (?) (Whittington 1981b)
23. *Halichondrites* – sessile attached filter-feeder (Rigby 1983)
24. *Hallucigenia* – benthic vagrant scavenger (?) (Conway Morris 1977)
25. *Hamptonia* – sessile attached filter-feeder (Rigby 1983)
26. *Haplophrentis* – benthic vagrant filter-feeder (Marek et al. 1997)
27. *Hazelia* – sessile attached filter-feeder (Rigby 1983)
28. *Helcionella* – benthic vagrant grazer (?) (e.g., Runnegar and Jell 1976)
29. *Helmetia* – pelagic swimming filter-feeder (e.g., Briggs et al. 1994)
30. *Hurdia* – pelagic swimming predator (e.g., Collins 1996)
31. *Isoxys* – pelagic swimming predator (?) (Vannier and Chen 2000)
32. undescribed medusoids – pelagic swimming predator (Chapter 3)
33. “Knobbly Cone” – unknown habits
34. *Kootenia* – benthic vagrant predator (Whittington 1980a)
35. *Laggania* – pelagic swimming predator (Collins 1996)
36. *Leancoilia* – nektobenthic scavenger (Bruton and Whittington 1983)
37. *Leptomit* – benthic attached filter-feeder (Rigby 1986)
38. *Liangshanella* – benthic/nektobenthic filter-feeders (Siveter and Williams 1997)
39. *Louisella* – infaunal vagrant predator (?) (Conway Morris 1977d)
40. *Mackenzia* – benthic attached filter-feeder (Briggs and Conway Morris 1986)
41. *Margaretia* – benthic attached (?) photoautotroph (Walcott 1919)
42. *Marpolia* – free-floating photoautotroph (Walcott 1919)
43. *Micromitra* – benthic attached filter-feeder (Walcott 1912d)

44. *Molaria* – benthic vagrant scavenger (Whittington 1981b)
45. *Mollisonia* – benthic vagrant scavenger (?) (Walcott 1912a)
46. *Naraoia* – benthic vagrant predator (Whittington 1977)
47. *Nectocaris* – pelagic swimming predator (?) (Conway Morris 1976b)
48. *Nisusia* – sessile attached filter-feeder (Walcott 1924a)
49. *Odaraia* – pelagic swimming predator (Briggs 1981a)
50. *Olenoides* – benthic vagrant predator (Whittington 1980a)
51. *Opabinia* – benthic/ pelagic swimming predator (Whittington 1975a)
52. *Oryctocephalus* – benthic vagrant predator (?) (e.g., Fortey and Owens 1999)
53. *Ottoia* – infaunal vagrant predator (Conway Morris 1977d)
54. *Pagetia* – pelagic swimming filter-feeder (Jell 1975)
55. *Parkaspis* – benthic vagrant predator (?) (e.g., Fortey and Owens 1999)
56. *Pirania* – sessile attached filter feeder (Rigby 1986)
57. *Pollingeria* – unknown habits
58. *Priscansermarinus* – sessile attached filter-feeder (Collins and Rudkin 1981)
59. “Sea Moth” – unknown habits
60. *Selkirkia* – infaunal vagrant carnivore (Conway Morris 1977d)
61. *Sidneyia* – nektobenthic predator/ scavenger (Bruton 1981)
62. *Skania* – benthic vagrant, unknown feeding (Walcott 1931)
63. *Takakkawia* – sessile attached filter-feeder (Rigby 1986)
64. *Tubulella* – sessile attached filter-feeder (?) (e.g., Mierjewski 1986)
65. *Tuzoia* – unknown habits
66. *Vauxia* – sessile attached filter-feeder (Rigby 1986)
67. *Waptia* – nektobenthic scavenger (e.g., Briggs et al. 1994)
68. *Yohoia* – pelagic swimming scavenger/ predator (?) (Whittington 1974)

APPENDIX II: Shannon-Wiener relative diversity (H_s)

RQ LEVEL	TAXON	TOTAL	pi	$\log pi$	$pi (\log pi)$
7.4 m	<i>Cambrorhynchium</i>	1	0.250	-0.60206	-0.150515
	<i>Leandroilia</i>	1	0.250	-0.60206	-0.150515
	<i>Sidneyia</i>	1	0.250	-0.60206	-0.150515
	<i>Vauxia</i>	1	0.250	-0.60206	-0.150515
	SUM	4			-0.60206
7.5 m	<i>Leandroilia</i>	4	1.000	0	0
	SUM	4			0
7.6 m	<i>Leandroilia</i>	3	0.200	-0.69897	-0.139794
	<i>Olenoides</i>	1	0.067	-1.17609	-0.0784061
	<i>Ottoia</i>	1	0.067	-1.17609	-0.0784061
	<i>Sidneyia</i>	8	0.533	-0.273	-0.1456007
	<i>Vauxia</i>	2	0.133	-0.87506	-0.1166748
	SUM	15			-0.5588817
7.8 m	<i>Banffia</i>	2	0.154	-0.81291	-0.1250636
	<i>Hallucigenia</i>	1	0.077	-1.11394	-0.085688
	<i>Leandroilia</i>	3	0.231	-0.63682	-0.1469589
	<i>Opabinia</i>	1	0.077	-1.11394	-0.085688
	<i>Ottoia</i>	1	0.077	-1.11394	-0.085688
	<i>Pollingeria</i>	3	0.231	-0.63682	-0.1469589
	"Sea Moth"	1	0.077	-1.11394	-0.085688
	<i>Vauxia</i>	1	0.077	-1.11394	-0.085688
	SUM	13			-0.8474212
7.9 m	<i>Banffia</i>	1	0.100	-1	-0.1
	<i>Leandroilia</i>	4	0.400	-0.39794	-0.159176
	<i>Mackenzia</i>	1	0.100	-1	-0.1
	<i>Ottoia</i>	3	0.300	-0.52288	-0.1568636
	<i>Vauxia</i>	1	0.100	-1	-0.1
	SUM	10			-0.6160396
8.0 m	agnostid	1	0.013	-1.87506	-0.0250008
	<i>Anomalocaris</i>	3	0.040	-1.39794	-0.0559176
	<i>Chancia</i>	1	0.013	-1.87506	-0.0250008

	"Creeposaurus"	1	0.013	-1.87506	-0.0250008
	<i>Emeraldella</i>	1	0.013	-1.87506	-0.0250008
	<i>Hurdia</i>	2	0.027	-1.57403	-0.0419742
	<i>Isoxys</i>	2	0.027	-1.57403	-0.0419742
	medusoid	1	0.013	-1.87506	-0.0250008
	<i>Leancoilia</i>	31	0.413	-0.3837	-0.1585958
	<i>Mackenzia</i>	1	0.013	-1.87506	-0.0250008
	<i>Micromitra</i>	1	0.013	-1.89209	-0.0242576
	<i>Mollisonia</i>	1	0.013	-1.87506	-0.0250008
	<i>Olenoides</i>	1	0.013	-1.87506	-0.0250008
	<i>Ottoia</i>	13	0.173	-0.76112	-0.1319271
	<i>Pollingeria</i>	1	0.013	-1.87506	-0.0250008
	<i>Sidneyia</i>	5	0.067	-1.17609	-0.0784061
	<i>Vauxia</i>	8	0.107	-0.97197	-0.1036769
	<i>Waptia</i>	1	0.013	-1.87506	-0.0250008
	SUM	75			-0.8867377
8.1 m	chancelloriid	6	0.207	-0.68425	-0.1415683
	"Creeposaurus"	1	0.034	-1.4624	-0.0504275
	<i>Haplophrentis</i>	1	0.034	-1.4624	-0.0504275
	<i>Helmetia</i>	1	0.034	-1.4624	-0.0504275
	<i>Kootenia</i>	1	0.034	-1.4624	-0.0504275
	<i>Laggania</i>	1	0.034	-1.4624	-0.0504275
	<i>Leancoilia</i>	9	0.310	-0.50816	-0.1577034
	<i>Micromitra</i>	2	0.069	-1.16137	-0.0800943
	<i>Ottoia</i>	3	0.103	-0.98528	-0.1019252
	<i>Sidneyia</i>	1	0.034	-1.4624	-0.0504275
	<i>Vauxia</i>	2	0.069	-1.16137	-0.0800943
	<i>Waptia</i>	1	0.034	-1.4624	-0.0504275
	SUM	29			-0.9143782
8.2 m	agnostid	2	0.010	-2.01284	-0.0195421
	<i>Anomalocaris</i>	2	0.010	-2.01284	-0.0195421
	<i>Cambrorhytium</i>	1	0.005	-2.31387	-0.0112324
	chancelloriid	20	0.097	-1.01284	-0.0983337
	<i>Choia</i>	53	0.257	-0.58959	-0.151691
	"Creeposaurus"	1	0.005	-2.31387	-0.0112324
	<i>Haplophrentis</i>	1	0.005	-2.31387	-0.0112324
	<i>Hurdia</i>	3	0.015	-1.83675	-0.0267487
	<i>Isoxys</i>	2	0.010	-2.01284	-0.0195421
	medusoid	1	0.005	-2.31387	-0.0112324

<i>Leancoilia</i>	37	0.180	-0.74567	-0.1339302
<i>L. persephone</i>	2	0.010	-2.01284	-0.0195421
<i>Micromitra</i>	17	0.083	-1.08342	-0.0894083
<i>Odaraia</i>	1	0.005	-2.31387	-0.0112324
<i>Olenoides</i>	3	0.015	-1.83675	-0.0267487
<i>Opabinia</i>	1	0.005	-2.31387	-0.0112324
<i>Oryctocephalus</i>	1	0.005	-2.31387	-0.0112324
<i>Ottoia</i>	16	0.078	-1.10975	-0.086194
<i>Pagetia</i>	1	0.005	-2.31387	-0.0112324
<i>Parkaspis</i>	1	0.005	-2.31387	-0.0112324
<i>Pollingeria</i>	19	0.092	-1.03511	-0.0954716
<i>Sidneyia</i>	3	0.015	-1.83675	-0.0267487
<i>Vauxia</i>	15	0.073	-1.13778	-0.0828478
<i>Waptia</i>	3	0.015	-1.83675	-0.0267487
SUM	206			-1.0241312

8.3 m

<i>Anomalocaris</i>	3	0.018	-1.75077	-0.0310787
<i>Branchiocaris</i>	1	0.006	-2.22789	-0.0131828
<i>chancelloriid</i>	27	0.160	-0.79652	-0.1272551
"Creeposaurus"	7	0.041	-1.38279	-0.0572753
"Darth Vader"	1	0.006	-2.22789	-0.0131828
<i>Emeraldella</i>	1	0.006	-2.22789	-0.0131828
<i>Haplophrentis</i>	1	0.006	-2.22789	-0.0131828
<i>Helmetia</i>	1	0.006	-2.22789	-0.0131828
<i>Hurdia</i>	1	0.006	-2.22789	-0.0131828
<i>Isoxys</i>	1	0.006	-2.22789	-0.0131828
medusoid	1	0.006	-2.22789	-0.0131828
<i>Laggania</i>	2	0.012	-1.92686	-0.022803
<i>Leancoilia</i>	33	0.195	-0.70937	-0.1385166
<i>L. persephone</i>	2	0.012	-1.92686	-0.022803
<i>Micromitra</i>	3	0.018	-1.75077	-0.0310787
<i>Odaraia</i>	1	0.006	-2.22789	-0.0131828
<i>Olenoides</i>	1	0.006	-2.22789	-0.0131828
<i>Ottoia</i>	48	0.284	-0.54665	-0.1552603
<i>Parkaspis</i>	1	0.006	-2.22789	-0.0131828
<i>Pollingeria</i>	12	0.071	-1.14871	-0.0815649
<i>Sidneyia</i>	1	0.006	-2.22789	-0.0131828
<i>Skania</i>	1	0.006	-2.22789	-0.0131828
<i>Vauxia</i>	17	0.101	-0.99744	-0.100334
<i>Waptia</i>	2	0.012	-1.92686	-0.022803
SUM	169			-0.9621485

8.4 m	agnostid	6	0.008	-2.09167	-0.0169366
	<i>Anomalocaris</i>	1	0.001	-2.86982	-0.0038729
	<i>Canadaspis</i>	1	0.001	-2.86982	-0.0038729
	<i>chancelloriid</i>	9	0.012	-1.91558	-0.0232661
	<i>Choia</i>	605	0.816	-0.08806	-0.0719002
	"Creeposaurus"	3	0.004	-2.3927	-0.009687
	<i>Haplophrentis</i>	1	0.001	-2.86982	-0.0038729
	<i>Hurdia</i>	2	0.003	-2.56879	-0.0069333
	<i>Isoxys</i>	1	0.001	-2.86982	-0.0038729
	<i>medusoid</i>	2	0.003	-2.56879	-0.0069333
	<i>Leancoilia</i>	31	0.042	-1.37846	-0.0576682
	<i>L. persephone</i>	3	0.004	-2.3927	-0.009687
	<i>Micromitra</i>	2	0.003	-2.56879	-0.0069333
	<i>Naraoia</i>	1	0.001	-2.86982	-0.0038729
	<i>Nectocaris</i>	1	0.001	-2.86982	-0.0038729
	<i>Odaraia</i>	1	0.001	-2.86982	-0.0038729
	<i>Oryctocephalus</i>	1	0.001	-2.86982	-0.0038729
	<i>Ottoia</i>	37	0.050	-1.30162	-0.064993
	<i>Pollingeria</i>	12	0.016	-1.79064	-0.0289982
	<i>Sidneyia</i>	10	0.013	-1.86982	-0.0252337
	<i>Vauxia</i>	8	0.011	-1.96673	-0.0212332
	<i>Waptia</i>	3	0.004	-2.3927	-0.009687
	SUM	741			-0.3910734

8.5 m	<i>Anomalocaris</i>	1	0.003	-2.45939	-0.0085396
	<i>Cambrorhytium</i>	1	0.003	-2.45939	-0.0085396
	<i>chancelloriid</i>	21	0.073	-1.13717	-0.0829189
	<i>Choia</i>	129	0.448	-0.3488	-0.1562346
	<i>Emeraldella</i>	2	0.007	-2.15836	-0.0149886
	<i>Habelia</i>	1	0.003	-2.45939	-0.0085396
	<i>Hurdia</i>	1	0.003	-2.45939	-0.0085396
	<i>Isoxys</i>	2	0.007	-2.15836	-0.0149886
	<i>Leancoilia</i>	25	0.087	-1.06145	-0.09214
	<i>Leptomitrus</i>	1	0.003	-2.45939	-0.0085396
	<i>Micromitra</i>	9	0.031	-1.50515	-0.0470359
	<i>Opabinia</i>	1	0.003	-2.45939	-0.0085396
	<i>Ottoia</i>	13	0.045	-1.34545	-0.0607321
	<i>Parkaspis</i>	3	0.010	-1.98227	-0.0206487
	<i>Pollingeria</i>	18	0.063	-1.20412	-0.0752575
	<i>Sidneyia</i>	4	0.014	-1.85733	-0.0257963

	<i>Skania</i>	1	0.003	-2.45939	-0.0085396
	<i>Tubulella</i>	32	0.111	-0.95424	-0.1060269
	<i>Vauxia</i>	17	0.059	-1.22894	-0.0725418
	<i>Waptia</i>	6	0.021	-1.68124	-0.0350259
	SUM	288			-0.8641127
8.6 m	agnostid	1	0.004	-2.38561	-0.0098173
	<i>Anomalocaris</i>	3	0.012	-1.90849	-0.0235615
	<i>Cambrorhytium</i>	1	0.004	-2.38561	-0.0098173
	chancelloriid	4	0.016	-1.78355	-0.0293588
	<i>Choia</i>	118	0.486	-0.31372	-0.1523435
	"Creeposaurus"	3	0.012	-1.90849	-0.0235615
	<i>Haplophrentis</i>	3	0.012	-1.90849	-0.0235615
	<i>Isoxys</i>	2	0.008	-2.08458	-0.017157
	<i>Leancoilia</i>	23	0.095	-1.02388	-0.0969103
	<i>L. persephone</i>	3	0.012	-1.90849	-0.0235615
	<i>Louisella</i>	1	0.004	-2.38561	-0.0098173
	<i>Micromitra</i>	1	0.004	-2.38561	-0.0098173
	<i>Naraoia</i>	1	0.004	-2.38561	-0.0098173
	<i>Olenoides</i>	1	0.004	-2.38561	-0.0098173
	<i>Ottoia</i>	19	0.078	-1.10685	-0.086544
	<i>Pagetia</i>	2	0.008	-2.08458	-0.017157
	<i>Pollingeria</i>	27	0.111	-0.95424	-0.1060269
	<i>Sidneyia</i>	13	0.053	-1.27166	-0.0680313
	<i>Skania</i>	1	0.004	-2.38561	-0.0098173
	<i>Vauxia</i>	15	0.062	-1.20952	-0.0746614
	<i>Waptia</i>	1	0.004	-2.38561	-0.0098173
	SUM	243			-0.820975
8.7 m	agnostid	1	0.007	-2.14301	-0.0154174
	chancelloriid	14	0.101	-0.99689	-0.1004059
	<i>Chancia</i>	1	0.007	-2.14301	-0.0154174
	<i>Choia</i>	13	0.094	-1.02907	-0.0962441
	"Creeposaurus"	3	0.022	-1.66589	-0.0359545
	<i>Echmatocrinus</i>	1	0.007	-2.14301	-0.0154174
	<i>Haplophrentis</i>	2	0.014	-1.84198	-0.0265034
	<i>Helmetia</i>	1	0.007	-2.14301	-0.0154174
	<i>Isoxys</i>	5	0.036	-1.44404	-0.0519441
	medusoid	2	0.014	-1.84198	-0.0265034
	<i>Leancoilia</i>	24	0.173	-0.7628	-0.1317071
	<i>L. persephone</i>	2	0.014	-1.84198	-0.0265034

<i>Mackenzia</i>	1	0.007	-2.14301	-0.0154174
<i>Micromitra</i>	5	0.036	-1.44404	-0.0519441
<i>Olenoides</i>	1	0.007	-2.14301	-0.0154174
<i>Opabinia</i>	1	0.007	-2.14301	-0.0154174
<i>Ottoia</i>	21	0.151	-0.8208	-0.1240051
<i>Pagetia</i>	1	0.007	-2.14301	-0.0154174
<i>Pollingeria</i>	11	0.079	-1.10162	-0.0871787
<i>Sidneyia</i>	5	0.036	-1.44404	-0.0519441
<i>Vauxia</i>	24	0.173	-0.7628	-0.1317071
SUM	139			-1.0658838

8.8 m	agnostid	3	0.013	-1.89209	-0.0242576
	<i>Anomalocaris</i>	1	0.004	-2.36922	-0.0101249
	chancelloriid	8	0.034	-1.46613	-0.050124
	<i>Chancia</i>	2	0.009	-2.06819	-0.0176768
	<i>Choia</i>	10	0.043	-1.36922	-0.0585135
	"Creeposaurus"	7	0.030	-1.52412	-0.0455933
	<i>Ctenorhabdotus</i>	1	0.004	-2.36922	-0.0101249
	<i>Emeraldella</i>	1	0.004	-2.36922	-0.0101249
	<i>Halichondrites</i>	1	0.004	-2.36922	-0.0101249
	<i>Hamptonia</i>	1	0.004	-2.36922	-0.0101249
	<i>Haplophrentis</i>	2	0.009	-2.06819	-0.0176768
	<i>Hazelia</i>	2	0.009	-2.06819	-0.0176768
	<i>Helmetia</i>	1	0.004	-2.36922	-0.0101249
	<i>Hurdia</i>	3	0.013	-1.89209	-0.0242576
	<i>Isoxys</i>	2	0.009	-2.06819	-0.0176768
	medusoid	2	0.009	-2.06819	-0.0176768
	<i>Leancoilia</i>	56	0.239	-0.62103	-0.148622
	<i>Micromitra</i>	1	0.004	-2.36922	-0.0101249
	<i>Naraoia</i>	1	0.004	-2.36922	-0.0101249
	<i>Olenoides</i>	1	0.004	-2.36922	-0.0101249
	<i>Ottoia</i>	46	0.197	-0.70646	-0.1388764
	<i>Pagetia</i>	4	0.017	-1.76716	-0.0302078
	<i>Pirania</i>	1	0.004	-2.36922	-0.0101249
	<i>Pollingeria</i>	33	0.141	-0.8507	-0.1199708
	<i>Priscansermarinus</i>	7	0.030	-1.52412	-0.0455933
	<i>Sidneyia</i>	15	0.064	-1.19312	-0.0764823
	<i>Vauxia</i>	19	0.081	-1.09046	-0.0885418
	<i>Waptia</i>	3	0.013	-1.89209	-0.0242576
	SUM	234			-1.0649306

8.9 m	agnostid	1	0.004	-2.42975	-0.0090325
	chancelloriid	27	0.100	-0.99839	-0.10021
	<i>Choia</i>	4	0.015	-1.82769	-0.0271776
	"Creeposaurus"	7	0.026	-1.58465	-0.0412364
	<i>Haplophrentis</i>	1	0.004	-2.42975	-0.0090325
	<i>Hazelia</i>	2	0.007	-2.12872	-0.0158269
	<i>Hurdia</i>	3	0.011	-1.95263	-0.0217766
	<i>Isoxys</i>	6	0.022	-1.6516	-0.0368387
	<i>Leancoilia</i>	33	0.123	-0.91124	-0.1117876
	<i>L. persephone</i>	3	0.011	-1.95263	-0.0217766
	<i>Mackenzia</i>	2	0.007	-2.12872	-0.0158269
	<i>Micromitra</i>	14	0.052	-1.28362	-0.0668057
	<i>Olenoides</i>	1	0.004	-2.42975	-0.0090325
	<i>Oryctocephalus</i>	2	0.007	-2.12872	-0.0158269
	<i>Ottoia</i>	22	0.082	-1.08733	-0.0889266
	<i>Pollingeria</i>	59	0.219	-0.6589	-0.1445172
	<i>Priscansermarinus</i>	10	0.037	-1.42975	-0.0531506
	<i>Sidneyia</i>	6	0.022	-1.6516	-0.0368387
	<i>Vauxia</i>	65	0.242	-0.61684	-0.1490503
	<i>Waptia</i>	1	0.004	-2.42975	-0.0090325
	SUM	269			-0.9837034

9.0 m	agnostid	3	0.007	-2.15635	-0.0150443
	<i>Anomalocaris</i>	3	0.007	-2.15635	-0.0150443
	chancelloriid	43	0.100	-1	-0.1
	<i>Chancia</i>	1	0.002	-2.63347	-0.0061243
	<i>Choia</i>	93	0.216	-0.66499	-0.1438224
	"Creeposaurus"	5	0.012	-1.9345	-0.0224942
	"Darth Vader"	1	0.002	-2.63347	-0.0061243
	<i>Emeraldella</i>	1	0.002	-2.63347	-0.0061243
	<i>Haplophrentis</i>	3	0.007	-2.15635	-0.0150443
	<i>Hazelia</i>	3	0.007	-2.15635	-0.0150443
	<i>Hurdia</i>	3	0.007	-2.15635	-0.0150443
	<i>Isoxys</i>	4	0.009	-2.03141	-0.0188968
	medusoid	3	0.007	-2.15635	-0.0150443
	<i>Leancoilia</i>	36	0.084	-1.07717	-0.0901813
	<i>L. persephone</i>	4	0.009	-2.03141	-0.0188968
	<i>Mackenzia</i>	2	0.005	-2.33244	-0.0108486
	<i>Micromitra</i>	7	0.016	-1.78837	-0.029113
	<i>Mollisonia</i>	1	0.002	-2.63347	-0.0061243
	<i>Naraoia</i>	1	0.002	-2.63347	-0.0061243

	<i>Nectocaris</i>	1	0.002	-2.63347	-0.0061243
	<i>Oryctocephalus</i>	1	0.002	-2.63347	-0.0061243
	<i>Ottoia</i>	68	0.158	-0.80096	-0.1266634
	<i>Pollingeria</i>	87	0.202	-0.69395	-0.1404037
	<i>Priscansermarinus</i>	1	0.002	-2.63347	-0.0061243
	"Sea Moth"	1	0.002	-2.63347	-0.0061243
	<i>Sidneyia</i>	17	0.040	-1.40302	-0.0554682
	<i>Vauxia</i>	34	0.079	-1.10199	-0.0871341
	<i>Waptia</i>	3	0.007	-2.15635	-0.0150443
	SUM	430			-1.0043516
9.1 m	<i>Anomalocaris</i>	2	0.007	-2.17609	-0.0145073
	chancelloriid	14	0.047	-1.33099	-0.062113
	<i>Choia</i>	131	0.437	-0.35985	-0.1571345
	"Creeposaurus"	1	0.003	-2.47712	-0.0082571
	<i>Echmatocrinus</i>	4	0.013	-1.87506	-0.0250008
	<i>Hazelia</i>	1	0.003	-2.47712	-0.0082571
	<i>Hurdia</i>	2	0.007	-2.17609	-0.0145073
	<i>Leancoilia</i>	12	0.040	-1.39794	-0.0559176
	<i>L. persephone</i>	1	0.003	-2.47712	-0.0082571
	<i>Mackenzia</i>	1	0.003	-2.47712	-0.0082571
	<i>Micromitra</i>	9	0.030	-1.52288	-0.0456864
	<i>Ottoia</i>	37	0.123	-0.90892	-0.1121001
	<i>Pagetia</i>	4	0.013	-1.87506	-0.0250008
	<i>Pollingeria</i>	36	0.120	-0.92082	-0.1104983
	<i>Sidneyia</i>	13	0.043	-1.36318	-0.059071
	<i>Skania</i>	1	0.003	-2.47712	-0.0082571
	<i>Takakkawia</i>	5	0.017	-1.77815	-0.0296359
	<i>Vauxia</i>	26	0.087	-1.06215	-0.0920528
	SUM	300			-0.844511
9.2 m	<i>Anomalocaris</i>	3	0.018	-1.74819	-0.0312176
	chancelloriid	28	0.167	-0.77815	-0.1296919
	<i>Chancia</i>	1	0.006	-2.22531	-0.0132459
	"Creeposaurus"	2	0.012	-1.92428	-0.0229081
	"H." <i>brevicauda</i>	1	0.006	-2.22531	-0.0132459
	<i>Hamptonia</i>	1	0.006	-2.22531	-0.0132459
	<i>Hurdia</i>	1	0.006	-2.22531	-0.0132459
	<i>Isoxys</i>	2	0.012	-1.92428	-0.0229081
	medusoid	3	0.018	-1.74819	-0.0312176
	<i>Leancoilia</i>	20	0.119	-0.92428	-0.1100332

	<i>L. persephone</i>	2	0.012	-1.92428	-0.0229081
	<i>Mackenzia</i>	5	0.030	-1.52634	-0.0454268
	<i>Micromitra</i>	3	0.018	-1.74819	-0.0312176
	<i>Naraoia</i>	1	0.006	-2.22531	-0.0132459
	<i>Opabinia</i>	1	0.006	-2.22531	-0.0132459
	<i>Ottoia</i>	37	0.220	-0.65711	-0.1447201
	<i>Pagetia</i>	3	0.018	-1.74819	-0.0312176
	<i>Pollingeria</i>	13	0.077	-1.11137	-0.0859986
	<i>Sidneyia</i>	9	0.054	-1.27107	-0.0680929
	<i>Takakkawia</i>	8	0.048	-1.32222	-0.0629628
	<i>Vauxia</i>	24	0.143	-0.8451	-0.1207283
	SUM	168			-1.0407247
9.3 m	chancelloriid	3	0.007	-2.15331	-0.0151286
	<i>Choia</i>	157	0.368	-0.43453	-0.159768
	"Creeposaurus"	3	0.007	-2.15331	-0.0151286
	<i>Hallucigenia</i>	3	0.007	-2.15331	-0.0151286
	<i>Haplophrentis</i>	3	0.007	-2.15331	-0.0151286
	<i>Hazelia</i>	1	0.002	-2.63043	-0.0061603
	<i>Hurdia</i>	8	0.019	-1.72734	-0.0323623
	<i>Isoxys</i>	5	0.012	-1.93146	-0.0226166
	medusoid	2	0.005	-2.3294	-0.0109105
	<i>Leancoilia</i>	51	0.119	-0.92286	-0.1102242
	<i>L. persephone</i>	5	0.012	-1.93146	-0.0226166
	<i>Mackenzia</i>	2	0.005	-2.3294	-0.0109105
	<i>Odaraia</i>	1	0.002	-2.63043	-0.0061603
	<i>Olenoides</i>	1	0.002	-2.63043	-0.0061603
	<i>Ottoia</i>	86	0.201	-0.69593	-0.1401638
	<i>Pollingeria</i>	66	0.155	-0.81088	-0.1253357
	<i>Sidneyia</i>	10	0.023	-1.63043	-0.0381833
	<i>Skania</i>	1	0.002	-2.63043	-0.0061603
	<i>Takakkawia</i>	4	0.009	-2.02837	-0.0190011
	<i>Vauxia</i>	14	0.033	-1.4843	-0.0486656
	<i>Waptia</i>	1	0.002	-2.63043	-0.0061603
	SUM	427			-0.832074
9.4 m	<i>Anomalocaris</i>	5	0.018	-1.73719	-0.0318167
	<i>Choia</i>	49	0.179	-0.74597	-0.1338914
	"Creeposaurus"	3	0.011	-1.95904	-0.0215279
	<i>Crumillospongia</i>	1	0.004	-2.43616	-0.0089237
	<i>Isoxys</i>	9	0.033	-1.48192	-0.0488545

	<i>Leancoilia</i>	29	0.106	-0.97376	-0.1034402
	<i>L. persephone</i>	2	0.007	-2.13513	-0.015642
	<i>Mackenzia</i>	1	0.004	-2.43616	-0.0089237
	<i>Micromitra</i>	1	0.004	-2.43616	-0.0089237
	<i>Naraoia</i>	1	0.004	-2.43616	-0.0089237
	<i>Ottoia</i>	32	0.117	-0.93101	-0.1091297
	<i>Pollingeria</i>	33	0.121	-0.91765	-0.1109246
	<i>Priscansermarinus</i>	56	0.205	-0.68797	-0.141123
	<i>Sidneyia</i>	12	0.044	-1.35698	-0.0596475
	<i>Takakkawia</i>	9	0.033	-1.48192	-0.0488545
	<i>Vauxia</i>	29	0.106	-0.97376	-0.1034402
	<i>Waptia</i>	1	0.004	-2.43616	-0.0089237
	SUM	273			-0.9729107
9.5 m	<i>Canadaspis</i>	1	0.005	-2.32015	-0.0111012
	chancelloriid	3	0.014	-1.84303	-0.0264549
	<i>Choia</i>	1	0.005	-2.32015	-0.0111012
	"Creeposaurus"	1	0.005	-2.32015	-0.0111012
	<i>Echmatocrinus</i>	1	0.005	-2.32015	-0.0111012
	<i>Haplophrentis</i>	1	0.005	-2.32015	-0.0111012
	<i>Hazelia</i>	1	0.005	-2.32015	-0.0111012
	<i>Isoxys</i>	5	0.024	-1.62118	-0.0387841
	medusoid	1	0.005	-2.32015	-0.0111012
	<i>Leancoilia</i>	17	0.081	-1.0897	-0.0886357
	<i>L. persephone</i>	3	0.014	-1.84303	-0.0264549
	<i>Margaretia</i>	2	0.010	-2.01912	-0.0193217
	<i>Micromitra</i>	1	0.005	-2.32015	-0.0111012
	<i>Olenoides</i>	1	0.005	-2.32015	-0.0111012
	<i>Opabinia</i>	3	0.014	-1.84303	-0.0264549
	<i>Ottoia</i>	46	0.220	-0.65739	-0.1446884
	<i>Pollingeria</i>	64	0.306	-0.51397	-0.1573868
	<i>Priscansermarinus</i>	30	0.144	-0.84303	-0.1210084
	<i>Sidneyia</i>	5	0.024	-1.62118	-0.0387841
	<i>Takakkawia</i>	2	0.010	-2.01912	-0.0193217
	<i>Vauxia</i>	18	0.086	-1.06487	-0.0917116
	<i>Waptia</i>	2	0.010	-2.01912	-0.0193217
	SUM	209			-0.9182395
9.6 m	chancelloriid	7	0.024	-1.62028	-0.0388424
	<i>Emeraldella</i>	1	0.003	-2.46538	-0.0084431
	<i>Hamptonia</i>	1	0.003	-2.46538	-0.0084431

	<i>Helmetia</i>	1	0.003	-2.46538	-0.0084431
	<i>Isoxys</i>	1	0.003	-2.46538	-0.0084431
	medusoid	2	0.007	-2.16435	-0.0148243
	<i>Leancoilia</i>	38	0.130	-0.8856	-0.1152492
	<i>L. persephone</i>	3	0.010	-1.98826	-0.0204273
	<i>Mackenzia</i>	6	0.021	-1.68723	-0.0346691
	<i>Odaraia</i>	1	0.003	-2.46538	-0.0084431
	<i>Olenoides</i>	2	0.007	-2.16435	-0.0148243
	<i>Ottoia</i>	74	0.253	-0.59615	-0.1510794
	<i>Pagetia</i>	3	0.010	-1.98826	-0.0204273
	<i>Pollingeria</i>	109	0.373	-0.42796	-0.1597508
	<i>Sidneyia</i>	9	0.031	-1.51114	-0.0465762
	<i>Vauxia</i>	33	0.113	-0.94687	-0.1070092
	<i>Waptia</i>	1	0.003	-2.46538	-0.0084431
	SUM	292			-0.7743383
9.7 m	<i>Anomalocaris</i>	3	0.023	-1.64015	-0.0375607
	chancelloriid	1	0.008	-2.11727	-0.0161624
	<i>Choia</i>	2	0.015	-1.81624	-0.0277289
	"Creeposaurus"	2	0.015	-1.81624	-0.0277289
	<i>Ctenorhabdotus</i>	1	0.008	-2.11727	-0.0161624
	"Darth Vader"	1	0.008	-2.11727	-0.0161624
	<i>Echmatocrinus</i>	3	0.023	-1.64015	-0.0375607
	<i>Hazelia</i>	1	0.008	-2.11727	-0.0161624
	<i>Hurdia</i>	1	0.008	-2.11727	-0.0161624
	<i>Isoxys</i>	1	0.008	-2.11727	-0.0161624
	medusoid	2	0.015	-1.81624	-0.0277289
	<i>Leancoilia</i>	22	0.168	-0.77485	-0.1301272
	<i>Mackenzia</i>	3	0.023	-1.64015	-0.0375607
	<i>Micromitra</i>	2	0.015	-1.81624	-0.0277289
	<i>Naraoia</i>	1	0.008	-2.11727	-0.0161624
	<i>Olenoides</i>	1	0.008	-2.11727	-0.0161624
	<i>Ottoia</i>	63	0.481	-0.31793	-0.152898
	<i>Pagetia</i>	1	0.008	-2.11727	-0.0161624
	<i>Pollingeria</i>	10	0.076	-1.11727	-0.0852879
	<i>Sidneyia</i>	2	0.015	-1.81624	-0.0277289
	<i>Vauxia</i>	7	0.053	-1.27217	-0.0679787
	<i>Waptia</i>	1	0.008	-2.11727	-0.0161624
	SUM	131			-0.8492421
9.8 m	<i>Anomalocaris</i>	2	0.016	-1.80956	-0.0280552

chancelloriid	3	0.023	-1.63347	-0.0379876
<i>Choia</i>	1	0.008	-2.11059	-0.0163612
"H." <i>brevicauda</i>	1	0.008	-2.11059	-0.0163612
<i>Hallucigenia</i>	3	0.023	-1.63347	-0.0379876
<i>Hamptonia</i>	1	0.008	-2.11059	-0.0163612
<i>Hazelia</i>	1	0.008	-2.11059	-0.0163612
<i>Helmetia</i>	1	0.008	-2.11059	-0.0163612
<i>Hurdia</i>	4	0.031	-1.50853	-0.0467761
<i>Isoxys</i>	4	0.031	-1.50853	-0.0467761
medusoid	9	0.070	-1.15635	-0.0806754
<i>Leancoilia</i>	39	0.302	-0.51953	-0.1570657
<i>L. persephone</i>	2	0.016	-1.80956	-0.0280552
<i>Mackenzia</i>	1	0.008	-2.11059	-0.0163612
<i>Margaretia</i>	1	0.008	-2.11059	-0.0163612
<i>Olenoides</i>	2	0.016	-1.80956	-0.0280552
<i>Opabinia</i>	1	0.008	-2.11059	-0.0163612
<i>Ottoia</i>	33	0.256	-0.59208	-0.1514612
<i>Pollingeria</i>	7	0.054	-1.26549	-0.0686701
<i>Priscansermarinus</i>	1	0.008	-2.11059	-0.0163612
"Sea Moth"	1	0.008	-2.11059	-0.0163612
<i>Sidneyia</i>	2	0.016	-1.80956	-0.0280552
<i>Takakkawia</i>	2	0.016	-1.80956	-0.0280552
<i>Vauxia</i>	7	0.054	-1.26549	-0.0686701
SUM	129			-0.9999576

9.9 m	<i>Anomalocaris</i>	1	0.017	-1.76343	-0.0304039
	<i>Ctenorhabdotus</i>	2	0.034	-1.4624	-0.0504275
	<i>Habelia</i>	1	0.017	-1.76343	-0.0304039
	<i>Isoxys</i>	1	0.017	-1.76343	-0.0304039
	medusoid	6	0.103	-0.98528	-0.1019252
	<i>Leancoilia</i>	16	0.276	-0.55931	-0.1542919
	<i>Mackenzia</i>	1	0.017	-1.76343	-0.0304039
	<i>Molaria</i>	1	0.017	-1.76343	-0.0304039
	<i>Nectocaris</i>	1	0.017	-1.76343	-0.0304039
	<i>Ottoia</i>	16	0.276	-0.55931	-0.1542919
	<i>Pollingeria</i>	5	0.086	-1.06446	-0.0917636
	"Sea Moth"	1	0.017	-1.76343	-0.0304039
	<i>Skania</i>	1	0.017	-1.76343	-0.0304039
	<i>Takakkawia</i>	3	0.052	-1.28631	-0.0665331
	<i>Vauxia</i>	1	0.017	-1.76343	-0.0304039
	<i>Waptia</i>	1	0.017	-1.76343	-0.0304039

	SUM	58			-0.9232725
10.0 m	<i>Anomalocaris</i>	1	0.005	-2.34242	-0.0106474
	chancelloriid	2	0.009	-2.04139	-0.0185581
	<i>Chancia</i>	1	0.005	-2.34242	-0.0106474
	<i>Ctenorhabdotus</i>	1	0.005	-2.34242	-0.0106474
	<i>Haplophrentis</i>	13	0.059	-1.22848	-0.072592
	<i>Hazelia</i>	3	0.014	-1.8653	-0.0254359
	<i>Hurdia</i>	2	0.009	-2.04139	-0.0185581
	<i>Isoxys</i>	1	0.005	-2.34242	-0.0106474
	medusoid	4	0.018	-1.74036	-0.031643
	<i>Leancoilia</i>	29	0.132	-0.88002	-0.1160033
	<i>L. persephone</i>	3	0.014	-1.8653	-0.0254359
	<i>Mackenzia</i>	2	0.009	-2.04139	-0.0185581
	<i>Margaretia</i>	1	0.005	-2.34242	-0.0106474
	<i>Naraoia</i>	1	0.005	-2.34242	-0.0106474
	<i>Olenoides</i>	3	0.014	-1.8653	-0.0254359
	<i>Opabinia</i>	1	0.005	-2.34242	-0.0106474
	<i>Ottoia</i>	54	0.245	-0.61003	-0.1497344
	<i>Pollingeria</i>	81	0.368	-0.43394	-0.159768
	<i>Priscansermarinus</i>	1	0.005	-2.34242	-0.0106474
	<i>Sidneyia</i>	4	0.018	-1.74036	-0.031643
	<i>Takakkawia</i>	1	0.005	-2.34242	-0.0106474
	<i>Vauxia</i>	10	0.045	-1.34242	-0.0610192
	<i>Waptia</i>	1	0.005	-2.34242	-0.0106474
	SUM	220			-0.8608586
10.1 m	<i>Anomalocaris</i>	2	0.023	-1.63347	-0.0379876
	chancelloriid	1	0.012	-1.9345	-0.0224942
	<i>Choia</i>	1	0.012	-1.9345	-0.0224942
	"Creeposaurus"	1	0.012	-1.9345	-0.0224942
	<i>Echmatocrinus</i>	11	0.128	-0.89311	-0.1142345
	<i>Haplophrentis</i>	1	0.012	-1.9345	-0.0224942
	<i>Isoxys</i>	1	0.012	-1.9345	-0.0224942
	medusoid	4	0.047	-1.33244	-0.0619739
	<i>Leancoilia</i>	18	0.209	-0.67923	-0.1421636
	<i>Micromitra</i>	1	0.012	-1.9345	-0.0224942
	<i>Nectocaris</i>	2	0.023	-1.63347	-0.0379876
	<i>Olenoides</i>	1	0.012	-1.9345	-0.0224942
	<i>Ottoia</i>	17	0.198	-0.70405	-0.1391726
	<i>Pollingeria</i>	13	0.151	-0.82056	-0.1240374

	<i>Sidneyia</i>	1	0.012	-1.9345	-0.0224942
	<i>Takakkawia</i>	7	0.081	-1.0894	-0.0886721
	<i>Vauxia</i>	2	0.023	-1.63347	-0.0379876
	<i>Waptia</i>	2	0.023	-1.63347	-0.0379876
	SUM	86			-1.0021579
10.2 m	chancelloriid	1	0.004	-2.37291	-0.0100547
	"Creeposaurus"	1	0.004	-2.37291	-0.0100547
	<i>Ctenorhabdotus</i>	1	0.004	-2.37291	-0.0100547
	<i>Echmatocrinus</i>	1	0.004	-2.37291	-0.0100547
	<i>Hurdia</i>	3	0.013	-1.89579	-0.024099
	<i>Isoxys</i>	1	0.004	-2.37291	-0.0100547
	medusoid	1	0.004	-2.37291	-0.0100547
	<i>Leancoilia</i>	30	0.127	-0.89579	-0.1138717
	<i>L. persephone</i>	2	0.008	-2.07188	-0.0175583
	<i>Naraoia</i>	1	0.004	-2.37291	-0.0100547
	<i>Nectocaris</i>	1	0.004	-2.37291	-0.0100547
	<i>Ottoia</i>	152	0.644	-0.19107	-0.123061
	<i>Pagetia</i>	10	0.042	-1.37291	-0.0581742
	<i>Pollingeria</i>	21	0.089	-1.05069	-0.0934938
	<i>Sidneyia</i>	4	0.017	-1.77085	-0.0300144
	<i>Takakkawia</i>	3	0.013	-1.89579	-0.024099
	<i>Vauxia</i>	3	0.013	-1.89579	-0.024099
	SUM	236			-0.5889084
10.3 m	chancelloriid	3	0.011	-1.94776	-0.0219672
	<i>Ctenorhabdotus</i>	1	0.004	-2.42488	-0.0091161
	<i>Haplophrentis</i>	1	0.004	-2.42488	-0.0091161
	<i>Isoxys</i>	4	0.015	-1.82282	-0.0274109
	medusoid	5	0.019	-1.72591	-0.0324419
	<i>Leancoilia</i>	31	0.117	-0.93352	-0.1087937
	<i>L. persephone</i>	2	0.008	-2.12385	-0.0159688
	<i>Micromitra</i>	10	0.038	-1.42488	-0.053567
	<i>Olenoides</i>	3	0.011	-1.94776	-0.0219672
	<i>Opabinia</i>	1	0.004	-2.42488	-0.0091161
	<i>Ottoia</i>	83	0.312	-0.5058	-0.1578259
	<i>Pagetia</i>	3	0.011	-1.94776	-0.0219672
	<i>Pollingeria</i>	107	0.402	-0.3955	-0.1590912
	"Sea Moth"	1	0.004	-2.42488	-0.0091161
	<i>Sidneyia</i>	5	0.019	-1.72591	-0.0324419
	<i>Takakkawia</i>	1	0.004	-2.42488	-0.0091161

	<i>Vauxia</i>	5	0.019	-1.72591	-0.0324419
	SUM	266			-0.7314655
10.4 m	<i>Anomalocaris</i>	2	0.013	-1.89487	-0.0241385
	<i>Choia</i>	2	0.013	-1.89487	-0.0241385
	<i>Haplophrentis</i>	6	0.038	-1.41775	-0.0541815
	<i>Hazelia</i>	3	0.019	-1.71878	-0.0328429
	<i>Hurdia</i>	3	0.019	-1.71878	-0.0328429
	<i>Isoxys</i>	4	0.025	-1.59384	-0.0406074
	medusoid	5	0.032	-1.49693	-0.0476729
	<i>Leancoilia</i>	36	0.229	-0.6396	-0.1466592
	<i>L. persephone</i>	3	0.019	-1.71878	-0.0328429
	<i>Naraoia</i>	1	0.006	-2.1959	-0.0139866
	<i>Nectocaris</i>	1	0.006	-2.1959	-0.0139866
	<i>Odaraia</i>	1	0.006	-2.1959	-0.0139866
	<i>Oryctocephalus</i>	1	0.006	-2.1959	-0.0139866
	<i>Ottoia</i>	49	0.312	-0.5057	-0.1578311
	<i>Pollingeria</i>	19	0.121	-0.91715	-0.1109922
	"Sea Moth"	1	0.006	-2.1959	-0.0139866
	<i>Sidneyia</i>	4	0.025	-1.59384	-0.0406074
	<i>Vauxia</i>	15	0.096	-1.01981	-0.0974339
	<i>Waptia</i>	1	0.006	-2.1959	-0.0139866
	SUM	157			-0.9267109
10.5 m	agnostid	1	0.004	-2.37291	-0.0100547
	<i>Anomalocaris</i>	2	0.008	-2.07188	-0.0175583
	<i>Byronia</i>	1	0.004	-2.37291	-0.0100547
	chancelloriid	1	0.004	-2.37291	-0.0100547
	<i>Choia</i>	1	0.004	-2.37291	-0.0100547
	<i>Haplophrentis</i>	5	0.021	-1.67394	-0.0354649
	<i>Hazelia</i>	1	0.004	-2.37291	-0.0100547
	<i>Hurdia</i>	3	0.013	-1.89579	-0.024099
	<i>Isoxys</i>	2	0.008	-2.07188	-0.0175583
	medusoid	13	0.055	-1.25897	-0.06935
	<i>Laggania</i>	1	0.004	-2.37291	-0.0100547
	<i>Leancoilia</i>	41	0.174	-0.76013	-0.1320562
	<i>L. persephone</i>	1	0.004	-2.37291	-0.0100547
	<i>Mackenzia</i>	1	0.004	-2.37291	-0.0100547
	<i>Nectocaris</i>	1	0.004	-2.37291	-0.0100547
	<i>Olenoides</i>	1	0.004	-2.37291	-0.0100547
	<i>Opabinia</i>	1	0.004	-2.37291	-0.0100547

	<i>Oryctocephalus</i>	2	0.008	-2.07188	-0.0175583
	<i>Ottoia</i>	119	0.504	-0.29737	-0.1499425
	<i>Pagetia</i>	1	0.004	-2.37291	-0.0100547
	<i>Pollingeria</i>	22	0.093	-1.03049	-0.0960626
	"Sea Moth"	1	0.004	-2.37291	-0.0100547
	<i>Sidneyia</i>	6	0.025	-1.59476	-0.0405448
	<i>Takakkawia</i>	2	0.008	-2.07188	-0.0175583
	<i>Vauxia</i>	6	0.025	-1.59476	-0.0405448
	SUM	236			-0.7890092
10.6 m	<i>Anomalocaris</i>	1	0.008	-2.08636	-0.0171013
	<i>Choia</i>	12	0.098	-1.00718	-0.0990667
	<i>Ctenorhabdotus</i>	1	0.008	-2.08636	-0.0171013
	<i>Hallucigenia</i>	1	0.008	-2.08636	-0.0171013
	<i>Haplophrentis</i>	1	0.008	-2.08636	-0.0171013
	<i>Helmetia</i>	1	0.008	-2.08636	-0.0171013
	<i>Isoxys</i>	6	0.049	-1.30821	-0.0643381
	medusoid	1	0.008	-2.08636	-0.0171013
	<i>Laggania</i>	1	0.008	-2.08636	-0.0171013
	<i>Leancoilia</i>	23	0.189	-0.72463	-0.1366109
	<i>L. persephone</i>	1	0.008	-2.08636	-0.0171013
	<i>Margaretia</i>	1	0.008	-2.08636	-0.0171013
	<i>Micromitra</i>	1	0.008	-2.08636	-0.0171013
	<i>Naraoia</i>	1	0.008	-2.08636	-0.0171013
	<i>Odaraia</i>	1	0.008	-2.08636	-0.0171013
	<i>Ottoia</i>	49	0.402	-0.39616	-0.1591149
	<i>Pagetia</i>	2	0.016	-1.78533	-0.0292677
	<i>Pollingeria</i>	4	0.033	-1.4843	-0.0486656
	"Sea Moth"	1	0.008	-2.08636	-0.0171013
	<i>Sidneyia</i>	2	0.016	-1.78533	-0.0292677
	<i>Vauxia</i>	10	0.082	-1.08636	-0.0890459
	<i>Waptia</i>	1	0.008	-2.08636	-0.0171013
	SUM	122			-0.894796
10.7 m	<i>Hurdia</i>	1	0.029	-1.53148	-0.0450435
	medusoid	1	0.029	-1.53148	-0.0450435
	<i>Laggania</i>	1	0.029	-1.53148	-0.0450435
	<i>Leancoilia</i>	10	0.294	-0.53148	-0.1563173
	<i>L. persephone</i>	2	0.059	-1.23045	-0.0723793
	<i>Margaretia</i>	1	0.029	-1.53148	-0.0450435
	<i>Micromitra</i>	2	0.059	-1.23045	-0.0723793

	<i>Odaraia</i>	1	0.029	-1.53148	-0.0450435
	<i>Ottoia</i>	12	0.353	-0.4523	-0.1596345
	<i>Priscansermarinus</i>	1	0.029	-1.53148	-0.0450435
	<i>Sidneyia</i>	1	0.029	-1.53148	-0.0450435
	<i>Vauxia</i>	1	0.029	-1.53148	-0.0450435
	SUM	34			-0.8210585
10.8 m	"Creeposaurus"	1	0.007	-2.13354	-0.0156878
	<i>Habelia</i>	1	0.007	-2.13354	-0.0156878
	<i>Isoxys</i>	3	0.022	-1.65642	-0.0365386
	medusoid	2	0.015	-1.83251	-0.0269487
	<i>Laggania</i>	1	0.007	-2.13354	-0.0156878
	<i>Leancoilia</i>	16	0.118	-0.92942	-0.1093434
	<i>L. persephone</i>	3	0.022	-1.65642	-0.0365386
	<i>Margaretia</i>	1	0.007	-2.13354	-0.0156878
	<i>Naraoia</i>	1	0.007	-2.13354	-0.0156878
	<i>Opabinia</i>	1	0.007	-2.13354	-0.0156878
	<i>Ottoia</i>	75	0.551	-0.25848	-0.1425428
	<i>Pagetia</i>	11	0.081	-1.09215	-0.0883354
	<i>Pollingeria</i>	13	0.096	-1.0196	-0.0974613
	<i>Takakkawia</i>	4	0.029	-1.53148	-0.0450435
	<i>Vauxia</i>	1	0.007	-2.13354	-0.0156878
	<i>Waptia</i>	2	0.015	-1.83251	-0.0269487
	SUM	136			-0.7195155
10.9 m	<i>Anomalocaris</i>	1	0.016	-1.78533	-0.0292677
	<i>Haplophrentis</i>	1	0.016	-1.78533	-0.0292677
	medusoid	3	0.049	-1.30821	-0.0643381
	<i>Leancoilia</i>	22	0.361	-0.44291	-0.159737
	<i>Ottoia</i>	18	0.295	-0.53006	-0.1564104
	<i>Pagetia</i>	1	0.016	-1.78533	-0.0292677
	<i>Pollingeria</i>	5	0.082	-1.08636	-0.0890459
	"Sea Moth"	2	0.033	-1.4843	-0.0486656
	<i>Sidneyia</i>	3	0.049	-1.30821	-0.0643381
	<i>Takakkawia</i>	1	0.016	-1.78533	-0.0292677
	<i>Vauxia</i>	3	0.049	-1.30821	-0.0643381
	<i>Waptia</i>	1	0.016	-1.78533	-0.0292677
	SUM	61			-0.7932117
11.0 m	agnostid	1	0.007	-2.16435	-0.0148243
	<i>Haplophrentis</i>	1	0.007	-2.16435	-0.0148243

	<i>Hurdia</i>	1	0.007	-2.16435	-0.0148243
	<i>Isoxys</i>	3	0.021	-1.68723	-0.0346691
	medusoid	5	0.034	-1.46538	-0.0501843
	"Knobbly Cone"	1	0.007	-2.16435	-0.0148243
	<i>Leancoilia</i>	29	0.199	-0.70195	-0.1394294
	<i>L. persephone</i>	2	0.014	-1.86332	-0.025525
	<i>Ottoia</i>	32	0.219	-0.6592	-0.1444828
	<i>Pollingeria</i>	66	0.452	-0.34481	-0.1558725
	<i>Sidneyia</i>	1	0.007	-2.16435	-0.0148243
	<i>Takakkawia</i>	1	0.007	-2.16435	-0.0148243
	<i>Vauxia</i>	3	0.021	-1.68723	-0.0346691
	SUM	146			-0.6737783
11.1 m	<i>Anomalocaris</i>	1	0.026	-1.59106	-0.0407965
	<i>Hamptonia</i>	1	0.026	-1.59106	-0.0407965
	<i>Hurdia</i>	1	0.026	-1.59106	-0.0407965
	medusoid	2	0.051	-1.29003	-0.0661556
	<i>Leancoilia</i>	15	0.385	-0.41497	-0.1596051
	<i>Margaretia</i>	1	0.026	-1.59106	-0.0407965
	<i>Ottoia</i>	12	0.308	-0.51188	-0.1575026
	<i>Pagetia</i>	3	0.077	-1.11394	-0.085688
	"Sea Moth"	1	0.026	-1.59106	-0.0407965
	<i>Sidneyia</i>	1	0.026	-1.59106	-0.0407965
	<i>Vauxia</i>	1	0.026	-1.59106	-0.0407965
	SUM	39			-0.754527
11.2 m	<i>Hurdia</i>	3	0.056	-1.25527	-0.0697374
	medusoid	4	0.074	-1.13033	-0.0837284
	<i>Laggania</i>	1	0.019	-1.73239	-0.0320814
	<i>Leancoilia</i>	12	0.222	-0.65321	-0.1451583
	<i>L. persephone</i>	2	0.037	-1.43136	-0.0530135
	<i>Mackenzia</i>	2	0.037	-1.43136	-0.0530135
	<i>Opabinia</i>	1	0.019	-1.73239	-0.0320814
	<i>Ottoia</i>	19	0.352	-0.45364	-0.1596141
	<i>Pagetia</i>	2	0.037	-1.43136	-0.0530135
	<i>Pollingeria</i>	3	0.056	-1.25527	-0.0697374
	<i>Sidneyia</i>	2	0.037	-1.43136	-0.0530135
	<i>Vauxia</i>	3	0.056	-1.25527	-0.0697374
	SUM	54			-0.8739296
11.3 m	<i>Haplophrentis</i>	1	0.025	-1.60206	-0.0400515

	<i>Hurdia</i>	2	0.050	-1.30103	-0.0650515
	<i>Isoxys</i>	1	0.025	-1.60206	-0.0400515
	<i>Leancoilia</i>	4	0.100	-1	-0.1
	<i>Ottoia</i>	23	0.575	-0.24033	-0.138191
	<i>Pollingeria</i>	4	0.100	-1	-0.1
	"Sea Moth"	1	0.025	-1.60206	-0.0400515
	<i>Sidneyia</i>	2	0.050	-1.30103	-0.0650515
	<i>Skania</i>	1	0.025	-1.60206	-0.0400515
	<i>Vauxia</i>	1	0.025	-1.60206	-0.0400515
	SUM	40			-0.6685515
11.4 m	<i>Anomalocaris</i>	1	0.012	-1.9345	-0.0224942
	<i>Ctenorhabdotus</i>	1	0.012	-1.9345	-0.0224942
	<i>Helmetia</i>	1	0.012	-1.9345	-0.0224942
	<i>Hurdia</i>	1	0.012	-1.9345	-0.0224942
	medusoid	7	0.081	-1.0894	-0.0886721
	<i>Leancoilia</i>	17	0.198	-0.70405	-0.1391726
	<i>Micromitra</i>	7	0.081	-1.0894	-0.0886721
	<i>Nectocaris</i>	2	0.023	-1.63347	-0.0379876
	<i>Ottoia</i>	31	0.360	-0.44314	-0.1597353
	<i>Pagetia</i>	1	0.012	-1.9345	-0.0224942
	<i>Pollingeria</i>	9	0.105	-0.98026	-0.1025849
	<i>Sidneyia</i>	3	0.035	-1.45738	-0.0508387
	<i>Vauxia</i>	3	0.035	-1.45738	-0.0508387
	<i>Waptia</i>	2	0.023	-1.63347	-0.0379876
	SUM	86			-0.8689607
11.5 m	<i>Alalcomenaeus</i>	1	0.022	-1.65321	-0.0367381
	<i>Choia</i>	1	0.022	-1.65321	-0.0367381
	<i>Haplophrentis</i>	2	0.044	-1.35218	-0.060097
	<i>Hazelia</i>	1	0.022	-1.65321	-0.0367381
	<i>Hurdia</i>	2	0.044	-1.35218	-0.060097
	<i>Isoxys</i>	1	0.022	-1.65321	-0.0367381
	medusoid	1	0.022	-1.65321	-0.0367381
	<i>Leancoilia</i>	11	0.244	-0.61182	-0.149556
	<i>Mackenzia</i>	7	0.156	-0.80811	-0.1257067
	<i>Micromitra</i>	8	0.178	-0.75012	-0.1333551
	<i>Ottoia</i>	1	0.022	-1.65321	-0.0367381
	<i>Pagetia</i>	6	0.133	-0.87506	-0.1166748
	<i>Sidneyia</i>	2	0.044	-1.35218	-0.060097
	<i>Vauxia</i>	1	0.022	-1.65321	-0.0367381

	SUM	45			-0.96275
11.6 m	chancelloriid	2	0.095	-1.02119	-0.0972561
	<i>Choia</i>	1	0.048	-1.32222	-0.0629628
	<i>Haplophrentis</i>	3	0.143	-0.8451	-0.1207283
	<i>Hurdia</i>	1	0.048	-1.32222	-0.0629628
	<i>Isoxys</i>	1	0.048	-1.32222	-0.0629628
	<i>Kootenia</i>	1	0.048	-1.32222	-0.0629628
	<i>Leancoilia</i>	2	0.095	-1.02119	-0.0972561
	<i>Micromitra</i>	6	0.286	-0.54407	-0.155448
	<i>Ottoia</i>	2	0.095	-1.02119	-0.0972561
	<i>Pagetia</i>	1	0.048	-1.32222	-0.0629628
	<i>Waptia</i>	1	0.048	-1.32222	-0.0629628
	SUM	21			-0.9457216
11.7 m	chancelloriid	2	0.182	-0.74036	-0.1346114
	<i>Choia</i>	1	0.091	-1.04139	-0.0946721
	"Darth Vader"	1	0.091	-1.04139	-0.0946721
	<i>Hurdia</i>	1	0.091	-1.04139	-0.0946721
	<i>Micromitra</i>	1	0.091	-1.04139	-0.0946721
	<i>Pollingeria</i>	5	0.455	-0.34242	-0.1556467
	SUM	11			-0.6689463
11.8 m	<i>Hurdia</i>	1	0.083	-1.07918	-0.0899318
	<i>Leancoilia</i>	4	0.333	-0.47712	-0.1590404
	<i>Micromitra</i>	1	0.083	-1.07918	-0.0899318
	<i>Ottoia</i>	1	0.083	-1.07918	-0.0899318
	<i>Pagetia</i>	4	0.333	-0.47712	-0.1590404
	<i>Waptia</i>	1	0.083	-1.07918	-0.0899318
	SUM	12			-0.6778079
11.9 m	agnostid	1	0.056	-1.25527	-0.0697374
	<i>Haplophrentis</i>	13	0.722	-0.14133	-0.1020711
	<i>Hurdia</i>	1	0.056	-1.25527	-0.0697374
	<i>Leancoilia</i>	1	0.056	-1.25527	-0.0697374
	<i>Mackenzia</i>	1	0.056	-1.25527	-0.0697374
	<i>Ottoia</i>	1	0.056	-1.25527	-0.0697374
	SUM	18			-0.4507579
12.0 m	chancelloriid	2	0.095	-1.02119	-0.0972561
	<i>Emeraldella</i>	1	0.048	-1.32222	-0.0629628

	<i>Haplophrentis</i>	9	0.429	-0.36798	-0.1577043
	<i>Isoxys</i>	2	0.095	-1.02119	-0.0972561
	<i>Leancoilia</i>	3	0.143	-0.8451	-0.1207283
	<i>Mackenzia</i>	1	0.048	-1.32222	-0.0629628
	<i>Micromitra</i>	1	0.048	-1.32222	-0.0629628
	<i>Molaria</i>	1	0.048	-1.32222	-0.0629628
	<i>Ottoia</i>	1	0.048	-1.32222	-0.0629628
	SUM	21			-0.787759
12.1 m	chancelloriid	17	0.680	-0.16749	-0.1138939
	<i>Haplophrentis</i>	1	0.040	-1.39794	-0.0559176
	<i>Micromitra</i>	7	0.280	-0.55284	-0.1547958
	SUM	25			-0.3246073
12.2 m	<i>Elrathina</i>	2	0.250	-0.60206	-0.150515
	<i>Hamptonia</i>	1	0.125	-0.90309	-0.1128862
	<i>Haplophrentis</i>	1	0.125	-0.90309	-0.1128862
	<i>Hurdia</i>	1	0.125	-0.90309	-0.1128862
	<i>Leancoilia</i>	1	0.125	-0.90309	-0.1128862
	<i>Pagetia</i>	1	0.125	-0.90309	-0.1128862
	<i>Parkaspis</i>	1	0.125	-0.90309	-0.1128862
	SUM	8			-0.8278325
12.3 m	<i>Haplophrentis</i>	1	0.250	-0.60206	-0.150515
	<i>Ottoia</i>	1	0.250	-0.60206	-0.150515
	<i>Pollingeria</i>	1	0.250	-0.60206	-0.150515
	<i>Vauxia</i>	1	0.250	-0.60206	-0.150515
	SUM	4			-0.60206
12.4 m	<i>Leancoilia</i>	1	0.500	-0.30103	-0.150515
	<i>Waptia</i>	1	0.500	-0.30103	-0.150515
	SUM	2			-0.30103
12.5 m	chancelloriid	1	0.083	-1.07918	-0.0899318
	<i>Haplophrentis</i>	1	0.083	-1.07918	-0.0899318
	<i>Hazelia</i>	1	0.083	-1.07918	-0.0899318
	<i>Hurdia</i>	1	0.083	-1.07918	-0.0899318
	<i>Leancoilia</i>	3	0.250	-0.60206	-0.150515
	<i>Mackenzia</i>	1	0.083	-1.07918	-0.0899318
	<i>Micromitra</i>	1	0.083	-1.07918	-0.0899318
	<i>Pagetia</i>	1	0.083	-1.07918	-0.0899318

	<i>Priscansermarinus</i>	1	0.083	-1.07918	-0.0899318
	<i>Sidneyia</i>	1	0.083	-1.07918	-0.0899318
	SUM	12			-0.9599009
12.6 m	<i>Ottoia</i>	2	0.667	-0.17609	-0.1173942
	<i>Vauxia</i>	1	0.333	-0.47712	-0.1590404
	SUM	3			-0.2764346
12.7 m	<i>Canadaspis</i>	1	0.167	-0.77815	-0.1296919
	chancelloriid	1	0.167	-0.77815	-0.1296919
	<i>Haplophrentis</i>	1	0.167	-0.77815	-0.1296919
	<i>Isoxys</i>	1	0.167	-0.77815	-0.1296919
	medusoid	1	0.167	-0.77815	-0.1296919
	<i>Leancoilia</i>	1	0.167	-0.77815	-0.1296919
	SUM	6			-0.7781513
12.8 m	agnostid	1	0.111	-0.95424	-0.1060269
	chancelloriid	3	0.333	-0.47712	-0.1590404
	<i>Leancoilia</i>	1	0.111	-0.95424	-0.1060269
	<i>L. persephone</i>	1	0.111	-0.95424	-0.1060269
	<i>Pagetia</i>	1	0.111	-0.95424	-0.1060269
	"Sea Moth"	1	0.111	-0.95424	-0.1060269
	<i>Skania</i>	1	0.111	-0.95424	-0.1060269
	SUM	9			-0.7952021
12.9 m	chancelloriid	5	0.556	-0.25527	-0.1418181
	<i>Mackenzia</i>	1	0.111	-0.95424	-0.1060269
	<i>Ottoia</i>	1	0.111	-0.95424	-0.1060269
	"Sea Moth"	1	0.111	-0.95424	-0.1060269
	<i>Sidneyia</i>	1	0.111	-0.95424	-0.1060269
	SUM	9			-0.5659258
13.0 m	chancelloriid	2	0.154	-0.81291	-0.1250636
	<i>Hurdia</i>	1	0.077	-1.11394	-0.085688
	<i>Leancoilia</i>	1	0.077	-1.11394	-0.085688
	<i>Mackenzia</i>	4	0.308	-0.51188	-0.1575026
	<i>Ottoia</i>	2	0.154	-0.81291	-0.1250636
	<i>Pollingeria</i>	1	0.077	-1.11394	-0.085688
	<i>Sidneyia</i>	1	0.077	-1.11394	-0.085688
	<i>Vauxia</i>	1	0.077	-1.11394	-0.085688
	SUM	13			-0.8360695

13.1 m	chancelloriid	1	0.200	-0.69897	-0.139794
	<i>Haplophrentis</i>	2	0.400	-0.39794	-0.159176
	medusoid	1	0.200	-0.69897	-0.139794
	<i>Vauxia</i>	1	0.200	-0.69897	-0.139794
	SUM	5			-0.578558
13.2 m	chancelloriid	5	0.094	-1.02531	-0.096727
	<i>Choia</i>	1	0.019	-1.72428	-0.0325335
	<i>Micromitra</i>	1	0.019	-1.72428	-0.0325335
	<i>Olenoides</i>	1	0.019	-1.72428	-0.0325335
	<i>Ottoia</i>	10	0.189	-0.72428	-0.1366558
	<i>Pagetia</i>	2	0.038	-1.42325	-0.0537074
	<i>Pollingeria</i>	31	0.585	-0.23291	-0.1362328
	"Sea Moth"	1	0.019	-1.72428	-0.0325335
	<i>Sidneyia</i>	1	0.019	-1.72428	-0.0325335
	SUM	53			-0.5859905
13.3 m	<i>Haplophrentis</i>	1	0.333	-0.47712	-0.1590404
	<i>Ottoia</i>	1	0.333	-0.47712	-0.1590404
	<i>Sidneyia</i>	1	0.333	-0.47712	-0.1590404
	SUM	3			-0.4771213
13.4 m	<i>Haplophrentis</i>	4	0.174	-0.75967	-0.1321161
	<i>Hurdia</i>	1	0.043	-1.36173	-0.0592056
	medusoid	2	0.087	-1.0607	-0.0922346
	<i>Laggania</i>	1	0.043	-1.36173	-0.0592056
	<i>Leancoilia</i>	1	0.043	-1.36173	-0.0592056
	<i>L. persephone</i>	1	0.043	-1.36173	-0.0592056
	<i>Ottoia</i>	9	0.391	-0.40749	-0.1594508
	<i>Pagetia</i>	1	0.043	-1.36173	-0.0592056
	<i>Priscansermarinus</i>	2	0.087	-1.0607	-0.0922346
	"Sea Moth"	1	0.043	-1.36173	-0.0592056
	SUM	23			-0.8312695
13.5 m	<i>Haplophrentis</i>	1	0.125	-0.90309	-0.1128862
	<i>Leancoilia</i>	2	0.250	-0.60206	-0.150515
	<i>Mackenzia</i>	1	0.125	-0.90309	-0.1128862
	<i>Micromitra</i>	2	0.250	-0.60206	-0.150515
	<i>Olenoides</i>	1	0.125	-0.90309	-0.1128862
	"Sea Moth"	1	0.125	-0.90309	-0.1128862

	SUM	8			-0.752575
13.6 m	chancelloriid	5	0.128	-0.89209	-0.1143711
	<i>Hurdia</i>	1	0.026	-1.59106	-0.0407965
	<i>Isoxys</i>	6	0.154	-0.81291	-0.1250636
	<i>Leancoilia</i>	1	0.026	-1.59106	-0.0407965
	<i>Olenoides</i>	1	0.026	-1.59106	-0.0407965
	<i>Ottoia</i>	1	0.026	-1.59106	-0.0407965
	<i>Pagetia</i>	2	0.051	-1.29003	-0.0661556
	<i>Priscansermarinus</i>	22	0.564	-0.24864	-0.1402595
	SUM	39			-0.609036
13.7 m	agnostid	1	0.143	-0.8451	-0.1207283
	"Creeposaurus"	1	0.143	-0.8451	-0.1207283
	<i>Hazelia</i>	1	0.143	-0.8451	-0.1207283
	<i>Isoxys</i>	1	0.143	-0.8451	-0.1207283
	<i>L. persephone</i>	2	0.286	-0.54407	-0.155448
	<i>Margaretia</i>	1	0.143	-0.8451	-0.1207283
	SUM	7			-0.7590895
13.8 m	<i>Hurdia</i>	1	1.000	0	0
	SUM	1			0
13.9 m	<i>Anomalocaris</i>	1	0.333	-0.47712	-0.1590404
	<i>Hurdia</i>	1	0.333	-0.47712	-0.1590404
	<i>Molaria</i>	1	0.333	-0.47712	-0.1590404
	SUM	3			-0.4771213
14.0 m	<i>Alalcomenaeus</i>	1	0.333	-0.47712	-0.1590404
	chancelloriid	1	0.333	-0.47712	-0.1590404
	<i>Vauxia</i>	1	0.333	-0.47712	-0.1590404
	SUM	3			-0.4771213
14.2 m	<i>Leancoilia</i>	2	0.333	-0.47712	-0.1590404
	<i>Ottoia</i>	4	0.667	-0.17609	-0.1173942
	SUM	6			-0.2764346
14.4 m	<i>Waptia</i>	1	1.000	0	0
	SUM	1			0
14.5 m	<i>Waptia</i>	1	1.000	0	0

	SUM	1			0
14.6 m	<i>L. persephone</i>	1	1.000	0	0
	SUM	1			0
14.8 m	<i>Haplophrentis</i>	2	0.500	-0.30103	-0.150515
	<i>Opabinia</i>	2	0.500	-0.30103	-0.150515
	SUM	4			-0.30103
15.0 m	<i>L. persephone</i>	1	1.000	0	0
	SUM	1			0
15.3 m	<i>Hurdia</i>	1	0.500	-0.30103	-0.150515
	<i>Mackenzia</i>	1	0.500	-0.30103	-0.150515
	SUM	2			-0.30103
15.4 m	<i>Hurdia</i>	1	0.333	-0.47712	-0.1590404
	medusoid	1	0.333	-0.47712	-0.1590404
	<i>Sidneyia</i>	1	0.333	-0.47712	-0.1590404
	SUM	3			-0.4771213
15.5 m	<i>Choia</i>	1	0.333	-0.47712	-0.1590404
	<i>Haplophrentis</i>	1	0.333	-0.47712	-0.1590404
	"Sea Moth"	1	0.333	-0.47712	-0.1590404
	SUM	3			-0.4771213
15.6 m	chancelloriid	1	0.167	-0.77815	-0.1296919
	<i>Haplophrentis</i>	1	0.167	-0.77815	-0.1296919
	<i>Hurdia</i>	1	0.167	-0.77815	-0.1296919
	<i>Leancoilia</i>	1	0.167	-0.77815	-0.1296919
	<i>Sidneyia</i>	1	0.167	-0.77815	-0.1296919
	<i>Yohoia</i>	1	0.167	-0.77815	-0.1296919
	SUM	6			-0.7781513
15.7 m	<i>Choia</i>	1	0.500	-0.30103	-0.150515
	<i>Leancoilia</i>	1	0.500	-0.30103	-0.150515
	SUM	2			-0.30103
15.8 m	<i>Haplophrentis</i>	1	0.250	-0.60206	-0.150515
	<i>Leancoilia</i>	1	0.250	-0.60206	-0.150515
	<i>Mackenzia</i>	1	0.250	-0.60206	-0.150515

	<i>Sidneyia</i>	1	0.250	-0.60206	-0.150515
	SUM	4			-0.60206
15.9 m	<i>Leancoilia</i>	1	1.000	0	0
	SUM	1			0
16.1 m	<i>Ottoia</i>	2	0.667	-0.17609	-0.1173942
	<i>Pagetia</i>	1	0.333	-0.47712	-0.1590404
	SUM	3			-0.2764346
16.5 m	<i>Leancoilia</i>	1	1.000	0	0
	SUM	1			0
16.7 m	chancelloriid	1	0.200	-0.69897	-0.139794
	<i>Choia</i>	2	0.400	-0.39794	-0.159176
	<i>Micromitra</i>	1	0.200	-0.69897	-0.139794
	<i>Ottoia</i>	1	0.200	-0.69897	-0.139794
	SUM	5			-0.578558
17.2 m	<i>Elrathina</i>	1	0.500	-0.30103	-0.150515
	<i>Oryctocephalus</i>	1	0.500	-0.30103	-0.150515
	SUM	2			-0.30103

Hs

0.60206

0

0.55888

0.84742

0.61604

0.88674

0.91438

1.02413

0.96215

0.39107

0.86411

0.82097

1.06588

1.06493

0.9837

1.00435

0.84451

1.04072

0.83207

0.97291

0.91824

0.77434

0.84924

0.99996

0.92327

0.86086

1.00216

0.58891

0.73147

0.92671

0.78901

0.8948

0.82106

0.71952

0.79321

0.67378

0.75453

0.87393

0.66855

0.86896

0.96275

0.94572

0.66895

0.67781

0.45076

0.78776

0.32461

0.82783

0.60206

0.30103

0.9599

0.27643

0.77815

0.7952

0.56593

0.83607

0.57856

0.58599

0.47712

0.83127

0.75257

0.60904

0.75909

0

0.47712

0.47712

0.27643

0

0

0

0.30103

0

0.30103

0.47712

0.47712

0.77815

0.30103

0.60206

0

0.27643

0

0.57856

0.30103

APPENDIX III: Dimensions used for individual biovolumetric estimates

Ottoia -- cylinder $(1/2 \pi r^2 L) = (0.5)(\pi)(10 \text{ mm})^2(90 \text{ mm}) = 28274 \text{ mm}^3$

Choia -- cylinder $(1/2 \pi r^2 L) = (0.5)(\pi)(3.75 \text{ mm})^2(1 \text{ mm}) = 44 \text{ mm}^3$

Pollingeria -- cylinder $(1/2 \pi r^2 L) = (0.5)(\pi)(5 \text{ mm})^2(20 \text{ mm}) = 1571 \text{ mm}^3$

Leancoilia -- rectangular prism $(LWH) = (70 \text{ mm})(35 \text{ mm})(10 \text{ mm}) = 24500 \text{ mm}^3$

Vauxia -- cone $(1/3 \pi r^2 H) = (0.333)(\pi)(5 \text{ mm})^2(75 \text{ mm}) = 1964 \text{ mm}^3$

chancelloriids -- cone $(1/3 \pi r^2 H) = (0.333)(\pi)(12.5 \text{ mm})^2(90 \text{ mm}) = 14726 \text{ mm}^3$

Sidneyia -- triangular prism $(1/2 BHW) = (0.5)(50 \text{ mm})(150 \text{ mm})(15 \text{ mm}) = 56250 \text{ mm}^3$

Priscansermarinus -- two cylinders $(1/2 \pi r_1^2 L_1) + (1/2 \pi r_2^2 L_2)$
 $= (0.5)(\pi)(5 \text{ mm})^2(15 \text{ mm}) + (0.5)(\pi)(2.75 \text{ mm})^2(16 \text{ mm}) = 1582 \text{ mm}^3$

Pagetia -- rectangular prism $(LWH) = (6 \text{ mm})(4 \text{ mm})(1.5 \text{ mm}) = 36 \text{ mm}^3$

undescribed medudusoids -- cylinder $(1/2 \pi r^2 L)$
 $= (0.5)(\pi)(45 \text{ mm})^2(100 \text{ mm}) = 636170 \text{ mm}^3$

Hurdia -- cylinder $(1/2 \pi r^2 L) = (0.5)(\pi)(25 \text{ mm})^2(200 \text{ mm}) = 130900 \text{ mm}^3$

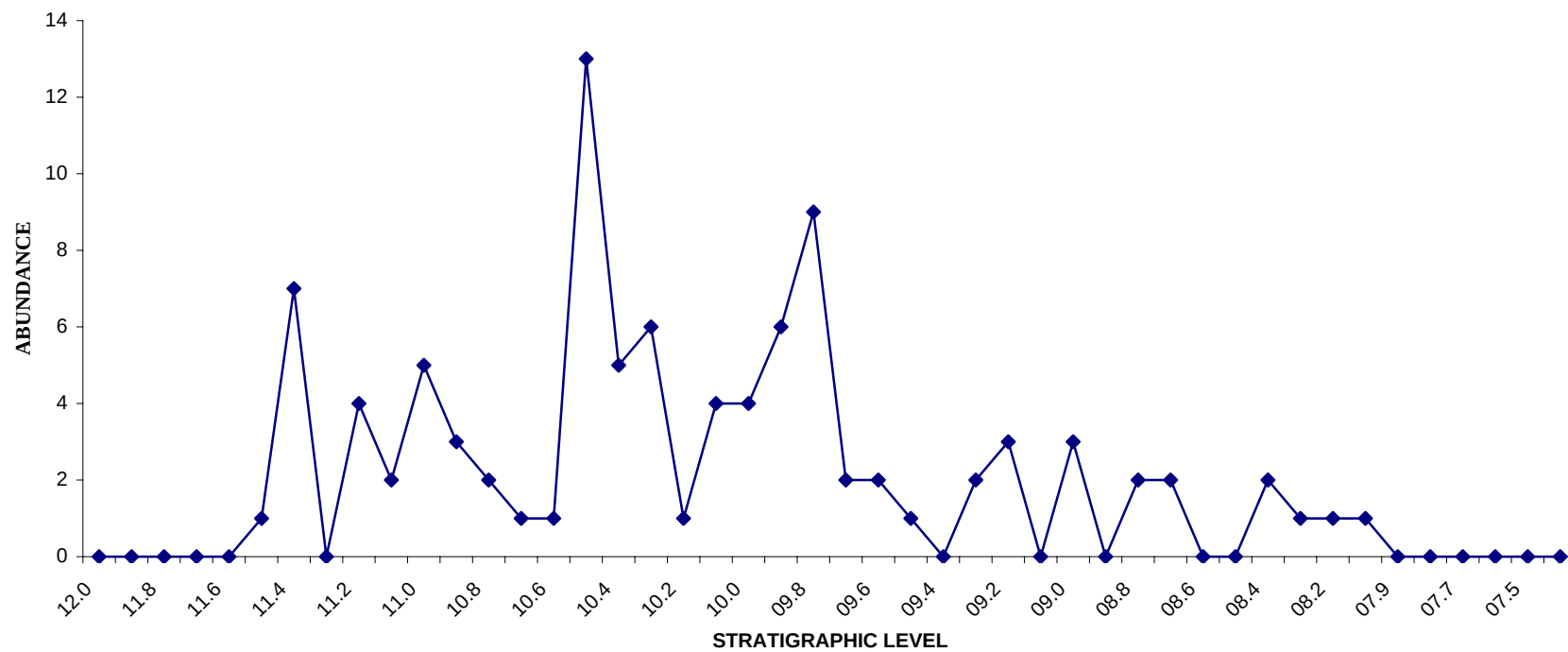
Appendix IV

Importance of taxa in the whole Raymond Quarry fauna by number of individuals.
A taxon in bold refers to a member of the trophic nucleus.

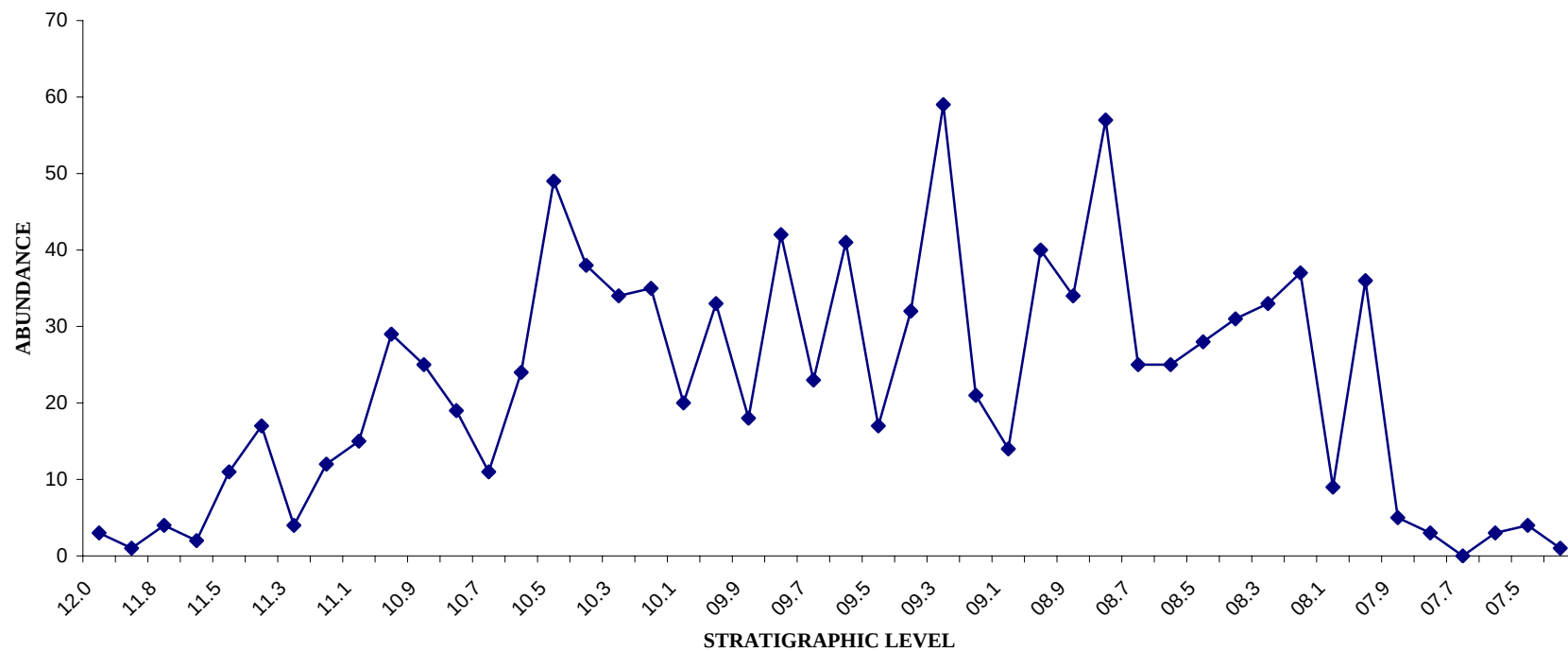
TAXA	TOT. FOSSILS	ELIMINATED	INCLUDED	% OF RQ FAUNA
agnostid	23	0	23	0.305
<i>Alalcomenaeus</i>	3	0	3	0.040
<i>Liangshanella</i>	293	293	0	0.000
undet. anomalocarid	79	45	34	0.450
<i>Anomalocaris</i>	204	155	49	0.649
"appendage F"	148	148	0	0.000
<i>Banffia</i>	3	0	3	0.040
<i>Branchiocaris</i>	1	0	1	0.013
<i>Byronia</i>	1	0	1	0.013
<i>Cambrorhytium</i>	4	0	4	0.053
<i>Canadaspis</i>	4	0	4	0.053
<i>Carnarvonia</i>	4	4	0	0.000
chancelloriid	297	0	297	3.934
<i>Chancia</i>	12	4	8	0.106
Choia	1434	0	1434	18.996
"Creeposaurus"	57	0	57	0.755
<i>Crumillosporgia</i>	1	0	1	0.013
<i>Ctenorhabdotus</i>	9	0	9	0.119
"Darth Vader"	4	0	4	0.053
<i>Echmatocrinus</i>	21	0	21	0.278
<i>Ehmaniella</i>	4	4	0	0.000
<i>Elrathina</i>	5	1	4	0.053
<i>Emeraldella</i>	9	0	9	0.119
<i>Gogia</i>	1	1	0	0.000
<i>Habelia</i>	3	0	3	0.040
"H." <i>brevicauda</i>	4	0	4	0.053
<i>Halichondrites</i>	1	0	1	0.013
<i>Hallucigenia</i>	7	0	7	0.093
<i>Hamptonia</i>	6	0	6	0.079
<i>Haplophrentis</i>	107	43	64	0.848
<i>Hazelia</i>	23	0	23	0.305
helcionellid	22	22	0	0.000
<i>Helmetia</i>	8	0	8	0.106
Hurdia	217	143	74	0.980
algal remains	8	0	8	0.106
undet. arthropod	96	46	50	0.662

"worm"	94	0	94	1.245
<i>Isoxys</i>	98	58	40	0.530
medusoid	104	0	104	1.378
"Knobbly Cone"	1	0	1	0.013
<i>Kootenia</i>	6	4	2	0.026
<i>Laggania</i>	9	0	9	0.119
<i>Leancoilia</i>	1079	82	997	13.207
<i>L. persephone</i>	68	3	65	0.861
<i>Leptomitrus</i>	1	0	1	0.013
<i>Louisella</i>	1	0	1	0.013
<i>Mackenzia</i>	52	0	52	0.689
<i>Margaretia</i>	12	0	12	0.159
<i>Micromitra</i>	129	80	49	0.649
<i>Molaria</i>	3	0	3	0.040
<i>Mollisonia</i>	3	0	3	0.040
<i>Naraoia</i>	12	0	12	0.159
<i>Nectocaris</i>	11	0	11	0.146
<i>Nisusia</i>	11	11	0	0.000
<i>Odaraia</i>	10	2	8	0.106
<i>Olenoides</i>	46	17	29	0.384
<i>Opabinia</i>	16	0	16	0.212
<i>Oryctocephalus</i>	12	2	10	0.132
<i>Ottoia</i>	1584	0	1584	20.983
<i>Pagetia</i>	114	0	114	1.510
<i>Parkaspis</i>	8	2	6	0.079
<i>Pirania</i>	1	0	1	0.013
<i>Pollingeria</i>	1135	0	1135	15.035
<i>Priscansermarinus</i>	132	0	132	1.749
"Sea Moth"	20	0	20	0.265
<i>Selkirkia</i>	2	2	0	0.000
<i>Sidneyia</i>	348	144	204	2.702
<i>Skania</i>	8	0	8	0.106
<i>Takakkawia</i>	53	0	53	0.702
<i>Tubulella</i>	67	35	32	0.424
<i>Tuzoia</i>	86	86	0	0.000
<i>Vauxia</i>	476	0	476	6.305
<i>Waptia</i>	70	20	50	0.662
<i>Yohoia</i>	1	0	1	0.013
TOTALS	9006	1457	7549	100.000

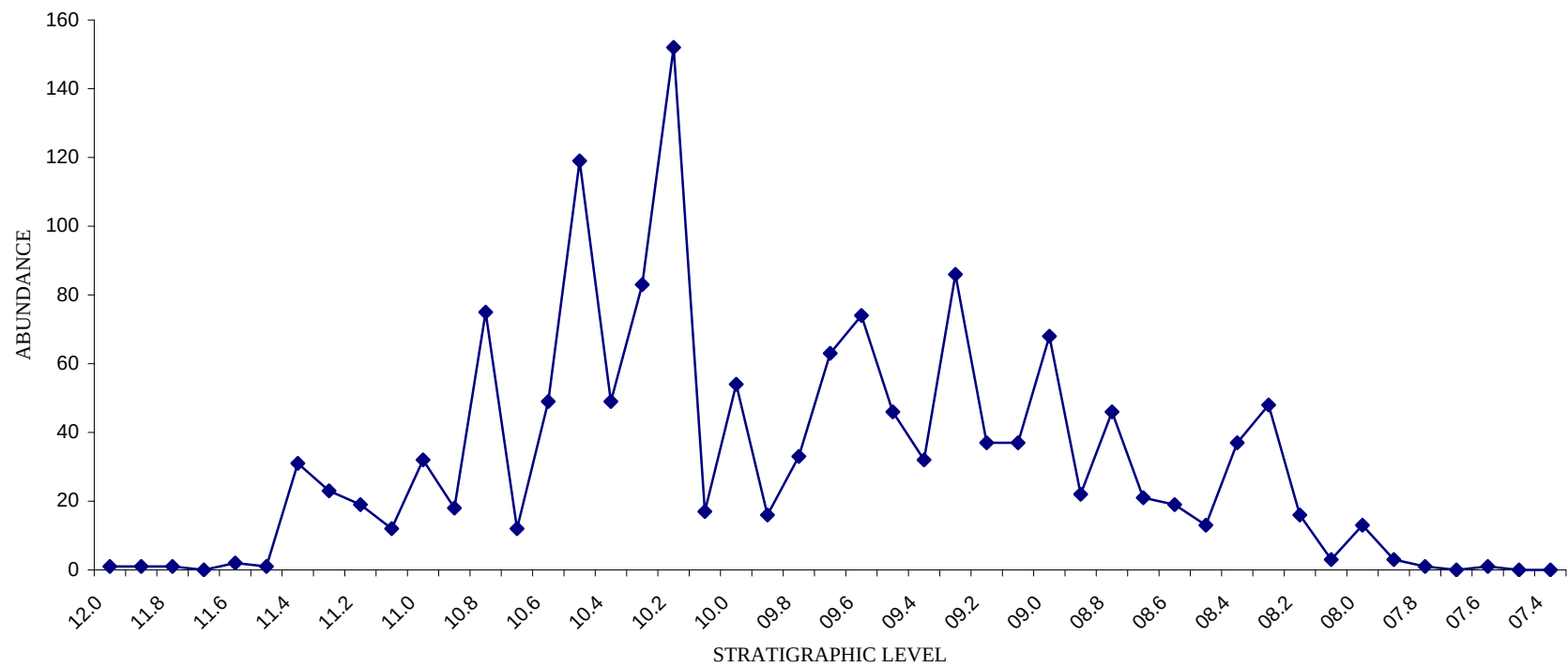
undescribed medusoids



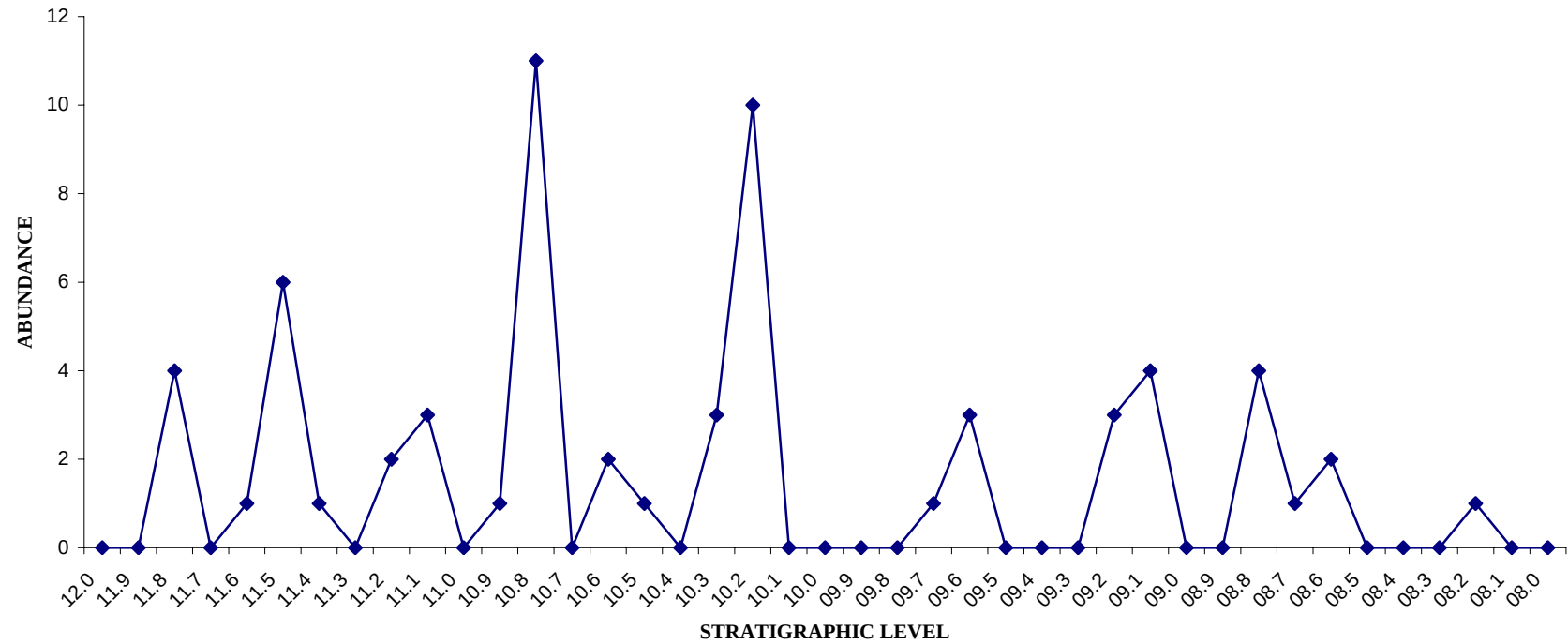
Leancoilia



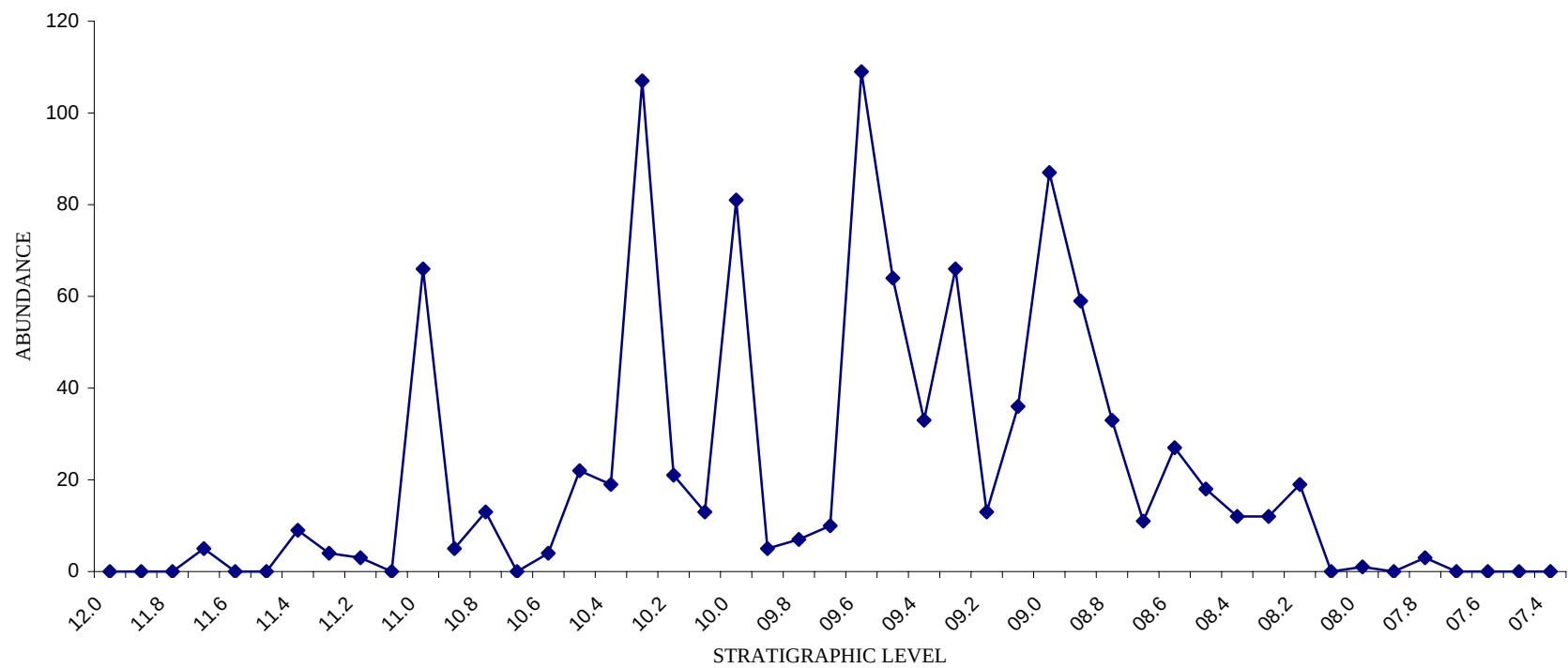
Ottoia



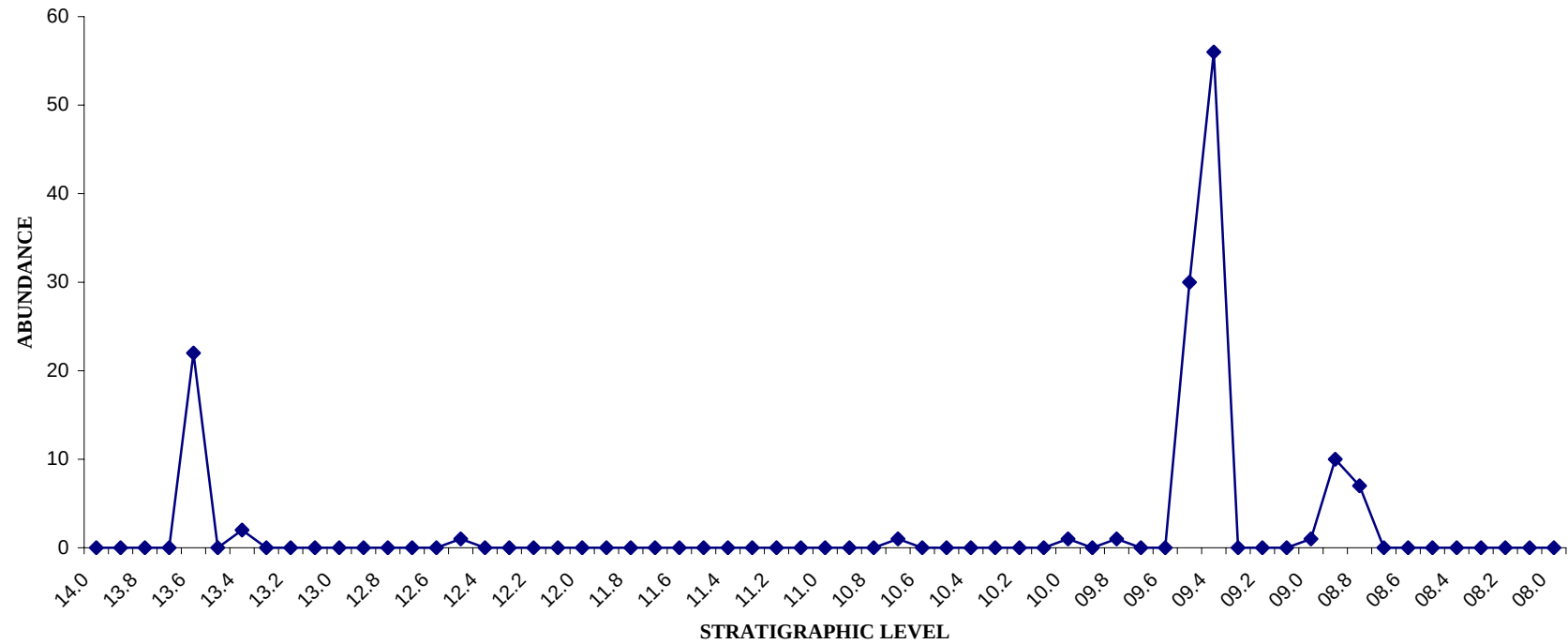
Pagetia



Pollingeria



Priscansermarinus



RAYMOND_QUARRY

RECORD	YR	ROM.	STR LEV	SP.	.ON SL	PHY	GEN/SP	HABIT
93011404		93 0114	8.5		4	1 UN	POLL	UN
93016401		93 0164	9.0		1	1 AR	HURD	PS
93016402		93 0164	9.0		2	1 AR	LEAN	NB
93016403		93 0164	9.0		3	2 PR	OTTO	IV
93012601		93 0126	8.8		1	1 AR	APPF	PS
93011801		93 0118	9.0		1	1 AR	HURD	PS
93011601		93 0116	8.9		1	1 AR	HURD	PS
93011602		93 0116	8.9		2	1 PO	VAUX	ES
93019601		93 0196	9.8		1	1 AR	HURD	PS
93043701		93 0437	15.8		1	2 AR	HURD	PS
93034401		93 0344	13.6		1	1 AR	HURD	PS
93034402		93 0344	13.6		2	1 AR	PAGE	PS
93034403		93 0344	13.6		3	1 AR	EHMA	EV
93045201		93 0452	9.3		1	1 AR	APPF	PS
93047301		93 0473	8.4		1	1 AR	HURD	PS
93047401		93 0474	8.4		1	1 AR	HURD	PS
93045401		93 0454	8.9		1	1 AR	HURD	PS
93045701		93 0457	9.4		1	1 AR	HURD	PS
93045702		93 0457	9.4		2	5 UN	POLL	UN
93047901		93 0479	15.6		1	1 AR	APPF	PS
93048101		93 0481	10.2		1	1 AR	HURD	PS
93047601		93 0476	8.7		1	1 AR	HURD	PS
93047602		93 0476	8.7		2	2 PR	OTTO	IV
93047603		93 0476	8.7		3	1 AR	LEAN	NB
93047604		93 0476	8.7		4	7 UN	POLL	UN
93047605		93 0476	8.7		5	4 PO	VAUX	ES
93049101		93 0491	15.6		1	1 AR	HURD	PS
93049701		93 0497	9.7		1	1 AR	APPF	PS
93049201		93 0492	14.2		1	1 AR	APPF	PS
93049901		93 0499	10.7		1	1 AR	HURD	PS
93050001		93 0500	15.6		1	1 AR	HURD	PS
93050002		93 0500	15.6		2	1 AR	EHMA	EV
93050801		93 0508	10.7		1	1 AR	HURD	PS
93050701		93 0507	13.9		1	1 AR	APPF	PS
93062701		93 0627	11.4		1	1 AR	APPF	PS
93062901		93 0629	11.7		1	1 BR	MICR	ES
93062902		93 0629	11.7		2	1 AR	HURD	PS
93073201		93 0732	8.5		1	1 AR	HURD	PS
93073202		93 0732	8.5		2	1 AR	LEAN	NB
93073601		93 0736	8.0		1	1 AR	HURD	PS
93073602		93 0736	8.0		2	1 PR	OTTO	IV
93084201		93 0842	8.4		1	1 AR	HURD	PS
93089701		93 0897	9.7		1	1 AR	APPF	PS
93100101		93 1001	13.4		1	1 AR	HURD	PS
93091001		93 0910	9.8		1	1 AR	APPF	PS
93091002		93 0910	9.8		2	1 PR	OTTO	IV
93088801		93 0888	8.4		1	1 AR	HURD	PS
93113801		93 1138	8.4		1	1 AR	HURD	PS
93105601		93 1056	13.1		1	2 AR	HURD	PS
93105602		93 1056	13.1		2	1 CN	JELL	PS

RAYMOND_QUARRY

93110801	93 1108	8.2	1	1 AR	HURD	PS
93140801	93 1408	9.0	1	1 AR	HURD	PS
93122401	93 1224	8.0	1	1 AR	HURD	PS
93122402	93 1224	8.0	2	1 AR	LEAN	NB
93122601	93 1226	9.6	1	1 AR	HURD	PS
93122602	93 1226	9.6	2	4 PR	OTTO	IV
93129201	93 1292	13.7	1	1 AR	APPF	PS
93014601	93 0146	8.2	1	1 AR	HURD	PS
93027601	93 0276	9.2	1	1 AR	ANOD	PS
93028001	93 0280	9.2	1	1 AR	HURD	PS
93028002	93 0280	9.2	2	2 UN	POLL	UN
93028003	93 0280	9.2	3	1 PO	VAUX	ES
93028901	93 0289	9.2	1	1 AR	ANOD	PS
93028101	93 0281	9.3	1	1 AR	HURD	PS
93028102	93 0281	9.3	2	8 UN	POLL	UN
93040801	93 0408	8.8	1	1 AR	HURD	PS
93046001	93 0460	8.4	1	1 AR	ANOD	PS
93046101	93 0461	15.8	1	1 AR	ANOD	PS
93055401	93 0554	8.7	1	1 AR	ANOD	PS
93046201	93 0462	8.6	1	1 AR	ANOD	PS
93074501	93 0745	8.8	1	1 AR	HURD	PS
93084401	93 0844	15.4	1	1 AR	HURD	PS
93046201	93 0462	15.8	1	1 AR	HURD	PS
93071901	93 0719	8.8	1	1 AR	ANOD	PS
93085001	93 0850	15.4	1	1 AR	HURD	PS
93085101	93 0851	14.6	1	1 AR	HURD	PS
93085401	93 0854	10.7	1	1 AR	HURD	PS
93108401	93 1084	8.3	1	1 AR	ANOD	PS
93121601	93 1216	13.9	1	1 AR	ANOD	PS
93090501	93 0905	8.1	1	1 AR	ANOD	PS
93090502	93 0905	8.1	2	1 PO	CHAN	ES
93113701	93 1137	8.7	1	1 AR	ANOD	PS
93122301	93 1223	8.3	1	1 AR	HURD	PS
93108501	93 1085	8.5	1	1 AR	HURD	PS
93108502	93 1085	8.5	2	2 UN	POLL	UN
93122801	93 1228	8.4	1	1 AR	ANOD	PS
93122802	93 1228	8.4	2	1 PO	VAUX	ES
93122803	93 1228	8.4	3	3 AR	ALUT	PS
93139901	93 1399	11.8	1	1 AR	ANOD	PS
93168501	93 1685	9.7	1	1 AR	HURD	PS
93168502	93 1685	9.7	2	1 PR	OTTO	IV
93141001	93 1410	8.8	1	1 AR	ANOD	PS
93141002	93 1410	8.8	2	1 PO	PIRA	ES
93169001	93 1690	11.4	1	1 AR	HURD	PS
93053001	93 0530	8.2	1	1 AR	HURD	PS
93053002	93 0530	8.2	2	15 UN	POLL	UN
93068701	93 0687	11.2	1	1 AR	HURD	PS
93068702	93 0687	11.2	2	1 PO	VAUX	ES
93068703	93 0687	11.2	3	2 AR	PAGE	PS
93087401	93 0874	15.3	1	1 AR	HURD	PS
93119501	93 1195	13.4	1	2 AR	HURD	PS

RAYMOND_QUARRY

93103201	93 1032	12.0	1	1 AR	EMER	EV
93028201	93 0282	9.5	1	1 AR	CANA	NB
93028202	93 0282	9.5	2	1 BR	MICR	ES
93028203	93 0282	9.5	3	3 UN	POLL	UN
93080301	93 0803	8.7	1	1 AR	SIDN	NB
93107201	93 1072	8.3	1	1 AR	EMER	EV
93057401	93 0574	8.4	1	1 AR	CANA	NB
93169501	93 1695	9.9	1	1 AR	HABE	EV
93109301	93 1093	8.3	1	1 AR	HELM	EV
93028601	93 0286	9.2	1	1 AR	ISOX	PS
93022801	93 0228	8.6	1	1 AR	ISOX	PS
93038601	93 0386	10.1	1	1 AR	ISOX	NB
93038602	93 0386	10.1	2	1 UN	POLL	UN
93031201	93 0312	10.8	1	1 AR	ISOX	PS
93012001	93 0120	10.2	1	1 AR	ISOX	PS
93047201	93 0472	8.7	1	1 AR	ISOX	PS
93050501	93 0505	9.7	1	1 AR	ISOX	PS
93053501	93 0535	8.2	1	1 AR	ISOX	PS
93062201	93 0622	9.0	1	1 AR	ISOX	PS
93076101	93 0761	10.3	1	1 AR	ISOX	PS
93089201	93 0892	9.4	1	1 AR	ISOX	PS
93091201	93 0912	9.8	1	1 AR	ISOX	PS
93096701	93 0967	8.7	1	1 AR	ISOX	PS
93117201	93 1172	8.3	1	1 AR	ISOX	PS
93125001	93 1250	9.5	1	1 AR	ISOX	PS
93127901	93 1279	9.3	1	1 AR	ISOX	PS
93000801	93 0008	11.0	1	1 AR	LEAP	NB
93004901	93 0049	8.7	1	1 AR	LEAP	NB
93031901	93 0319	9.4	1	1 AR	LEAP	NB
93042401	93 0424	NL	1	1 AR	LEAP	NB
93043901	93 0439	8.6	1	1 AR	LEAP	NB
93045101	93 0451	9.8	1	1 AR	LEAP	NB
93045901	93 0459	10.0	1	1 AR	LEAP	NB
93045801	93 0458	8.6	1	1 AR	LEAP	NB
93047001	93 0470	10.4	1	1 AR	LEAP	NB
93047101	93 0471	9.2	1	1 AR	LEAP	NB
93055601	93 0556	13.7	1	1 AR	LEAP	NB
93055602	93 0556	13.7	2	1 AR	INAR	UN
93086001	93 0860	10.0	1	1 AR	LEAP	NB
93088901	93 0889	13.7	1	1 AR	LEAP	NB
93117501	93 1175	9.6	1	1 AR	LEAP	NB
93092001	93 0920	9.6	1	1 AR	LEAP	NB
93105001	93 1050	12.8	1	1 AR	LEAP	NB
93117801	93 1178	8.9	1	1 AR	LEAP	NB
93118601	93 1186	8.2	1	1 AR	LEAP	NB
93118901	93 1189	8.6	1	1 AR	LEAP	NB
93127701	93 1277	9.0	1	1 AR	LEAP	NB
93128501	93 1285	13.4	1	1 AR	LEAP	NB
93156301	93 1563	10.3	1	1 AR	LEAP	NB
93000401	93 0004	8.5	1	1 AR	LEAN	NB
93000402	93 0004	8.5	2	1 AR	HABE	EV

RAYMOND_QUARRY

93000403	93 0004	8.5	3	2 AR	ALUT	PS
93000404	93 0004	8.5	4	1 AR	ISOX	PS
93091801	93 0918	12.0	1	1 AR	MOLA	EV
93088101	93 0881	9.9	1	1 AR	MOLA	EV
93029001	93 0290	10.7	1	1 AR	ODAR	PS
93052001	93 0520	9.2	1	1 AR	ODAR	PS
93061301	93 0613	8.2	1	1 AR	ODAR	PS
93061302	93 0613	8.2	2	1 PR	OTTO	IV
93118101	93 1181	10.4	1	33 AR	ALUT	PS
93117301	93 1173	9.9	1	1 AR	ALUT	PS
93038201	93 0382	9.4	1	28 AR	PRIS	ES
93038202	93 0382	9.4	2	1 AR	ANOM	PS
93038203	93 0382	9.4	3	1 PO	VAUX	ES
93054701	93 0547	8.9	1	10 AR	PRIS	ES
93091301	93 0913	10.0	1	1 AR	PRIS	ES
93091501	93 0915	9.0	1	1 AR	PRIS	ES
93091502	93 0915	9.0	2	1 PR	OTTO	IV
93131401	93 1314	13.6	1	22 AR	PRIS	ES
93146401	93 1464	13.4	1	1 AR	PRIS	ES
93146601	93 1466	13.4	1	1 AR	PRIS	ES
93037101	93 0371	16.2	1	1 UN	INDE	UN
93056101	93 0561	8.3	1	1 AR	SKAN	EV
93004801	93 0048	9.3	1	1 AR	TUZO	UN
93008201	93 0082	8.6	1	1 AR	CARN	UN
93008601	93 0086	9.8	1	1 AR	TUZO	UN
93016601	93 0166	9.6	1	1 AR	TUZO	UN
93016602	93 0166	9.6	2	1 AR	LEAN	NB
93013501	93 0135	10.2	1	1 AR	TUZO	UN
93021301	93 0213	8.2	1	1 AR	WAPT	NB
93038501	93 0385	9.3	1	1 AR	WAPT	NB
93031601	93 0316	9.7	1	1 AR	WAPT	NB
93050401	93 0504	8.8	1	1 AR	WAPT	NB
93060901	93 0609	8.5	1	1 AR	WAPT	NB
93060902	93 0609	8.5	2	1 PO	VAUX	ES
93060903	93 0609	8.5	3	3 AR	ALUT	PS
93060904	93 0609	8.5	4	1 UN	INTU	UN
93060905	93 0609	8.5	5	2 AN	POLY	UN
93069101	93 0691	8.6	1	1 AR	WAPT	NB
93069102	93 0691	8.6	2	1 UN	POLL	UN
93072801	93 0728	14.4	1	1 AR	WAPT	NB
93071701	93 0717	8.2	1	1 AR	WAPT	NB
93089501	93 0895	8.4	1	1 AR	WAPT	NB
93090601	93 0906	8.8	1	1 AR	WAPT	NB
93092601	93 0926	9.4	1	1 AR	WAPT	NB
93097101	93 0971	11.8	1	1 AR	WAPT	NB
93109901	93 1099	8.5	1	1 AR	WAPT	NB
93109902	93 1099	8.5	2	5 UN	POLL	UN
93108301	93 1083	8.4	1	1 AR	WAPT	NB
93111301	93 1113	8.5	1	1 AR	WAPT	NB
93114201	93 1142	8.4	1	1 AR	WAPT	NB
93114202	93 1142	8.4	2	1 PO	VAUX	ES

RAYMOND_QUARRY

93114203	93 1142	8.4	3	1 AR	ALUT	PS
93101001	93 1010	8.5	1	1 AR	WAPT	NB
93155501	93 1555	8.1	1	1 AR	WAPT	NB
93051201	93 0512	14.0	1	1 AR	TUZO	UN
93048301	93 0483	15.4	1	1 CN	JELL	PS
93101101	93 1011	8.5	1	1 AR	APPF	PS
93100201	93 1002	13.2	1	1 AR	INAR	UN
93021401	93 0214	NL	1	1 AR	APPF	PS
93050601	93 0506	9.9	1	1 AR	APPF	PS
93019101	93 0191	9.3	1	1 AR	APPF	PS
93016501	93 0165	10.9	1	1 AR	APPF	PS
93022701	93 0227	8.7	1	1 AR	APPF	PS
93139701	93 1397	12.5	1	1 AR	APPF	PS
93084901	93 0849	10.7	1	2 AR	APPF	PS
93084902	93 0849	10.7	2	1 PR	OTTO	IV
93139801	93 1398	11.8	1	1 AR	HURD	PS
93139802	93 1398	11.8	2	4 AR	PAGE	PS
93139803	93 1398	11.8	3	1 BR	MICR	ES
93145901	93 1459	13.4	1	1 AR	APPF	PS
93085501	93 0855	9.7	1	1 AR	DART	NB
93085502	93 0855	9.7	2	1 UN	POLL	UN
93156501	93 1565	13.7	1	1 AR	ANOD	PS
93146701	93 1467	13.5	1	2 AR	APPF	PS
93146702	93 1467	13.5	2	1 BR	MICR	ES
93014301	93 0143	8.2	1	1 AR	INAR	UN
93048001	93 0480	14.3	1	1 AR	INAR	UN
93042301	93 0423	9.2	1	1 AR	INAR	UN
93049801	93 0498	13.9	1	1 AR	MOLA	EV
93070001	93 0700	10.8	1	1 AR	LEAP	NB
93072001	93 0720	9.2	1	1 AR	INAR	UN
93115801	93 1158	8.4	1	1 AR	INAR	UN
93074701	93 0747	13.5	1	1 AR	LEAN	NB
93072101	93 0721	10.6	1	1 AR	INAR	UN
93117001	93 1170	8.4	1	1 AR	LEAN	NB
93117601	93 1176	9.8	1	1 AR	PRIS	ES
93124501	93 1245	9.8	1	1 AR	INAR	UN
93129301	93 1293	9.2	1	1 AR	INAR	UN
93060201	93 0602	8.7	1	1 AR	CHAP	EV
93107001	93 1070	8.3	1	1 PO	VAUX	ES
93109101	93 1091	8.5	1	1 PO	VAUX	ES
93119301	93 1193	8.6	1	1 PO	VAUX	ES
93112701	93 1127	8.3	1	1 PO	VAUX	ES
93112702	93 1127	8.3	2	1 AR	LEAN	NB
93112703	93 1127	8.3	3	1 AR	ALUT	PS
93112704	93 1127	8.3	4	1 UN	INDE	UN
93112901	93 1129	8.3	1	1 PO	VAUX	ES
93119101	93 1191	8.6	1	1 PO	VAUX	ES
93118801	93 1188	8.6	1	3 PO	VAUX	ES
93113501	93 1135	8.7	1	1 PO	VAUX	ES
93113502	93 1135	8.7	2	1 UN	INDE	UN
93113001	93 1130	8.3	1	1 PO	VAUX	ES

RAYMOND_QUARRY

93139201	93 1392	8.8	1	1 PO	VAUX	ES
93146201	93 1462	8.8	1	1 PO	HAZE	ES
93018401	93 0184	8.8	1	1 PO	HALI	ES
93018402	93 0184	8.8	2	3 AR	ALUT	PS
93018403	93 0184	8.8	3	1 AR	PAGE	PS
93047301	93 0473	10.7	1	1 AR	PRIS	ES
93004701	93 0047	12.9	1	1 CN	MACK	ES
93081101	93 0811	15.3	1	1 CN	MACK	ES
93025901	93 0259	9.2	1	1 CN	MACK	ES
93025701	93 0257	9.2	1	1 CN	MACK	ES
93005501	93 0055	9.2	1	1 CN	MACK	ES
93077501	93 0775	10.5	1	1 CN	MACK	ES
93077502	93 0775	10.5	2	1 AR	SIDN	NB
93021701	93 0217	10.9	1	2 CN	JELL	PS
93084701	93 0847	9.9	1	1 CN	MACK	ES
93027801	93 0278	10.3	1	1 CN	JELL	PS
93039201	93 0392	10.7	1	1 CN	JELL	PS
93041801	93 0418	10.5	1	1 CN	JELL	PS
93087501	93 0875	15.8	1	1 CN	MACK	PS
93065801	93 0658	9.0	1	3 CN	JELL	PS
93065802	93 0658	9.0	2	2 CN	MACK	ES
93073301	93 0733	9.9	1	2 CN	JELL	PS
93082001	93 0820	9.9	1	1 CN	JELL	PS
93082002	93 0820	9.9	2	1 AR	LEAN	NB
93082003	93 0820	9.9	3	1 PR	OTTO	IV
93082701	93 0827	9.9	1	1 CN	JELL	PS
93082702	93 0827	9.9	2	1 AR	ALUT	PS
93083201	93 0832	9.7	1	1 CN	JELL	PS
93093601	93 0936	9.6	1	2 CN	JELL	PS
93090701	93 0907	9.9	1	1 CN	JELL	PS
93105501	93 1055	8.4	1	1 CN	JELL	PS
93105502	93 1055	8.4	2	1 AR	LEAN	NB
93139001	93 1390	9.6	1	2 CN	MACK	ES
93165201	93 1652	9.5	1	1 CN	JELL	PS
93165202	93 1652	9.5	2	1 AR	ALUT	PS
93130201	93 1302	13.0	1	1 CN	MACK	ES
93130202	93 1302	13.0	2	1 UN	POLL	UN
93000601	93 0006	8.6	1	1 CN	CAMB	ES
93063301	93 0633	8.2	1	1 CN	CAMB	ES
93063501	93 0635	8.2	1	1 UN	INWO	UN
93005201	93 0052	9.2	1	1 AN	POLY	UN
93010401	93 0104	8.7	1	1 AN	POLY	UN
93010402	93 0104	8.7	2	1 AR	ALUT	PS
93094001	93 0940	9.2	1	1 AN	POLY	UN
93065501	93 0655	8.8	1	1 UN	INDE	UN
93100901	93 1009	8.4	1	3 UN	INWO	UN
93100902	93 1009	8.4	2	1 AN	POLY	UN
93097401	93 0974	8.4	1	1 AN	POLY	UN
93100801	93 1008	8.4	1	1 AN	POLY	UN
93110401	93 1104	8.4	1	1 AN	POLY	UN
93110402	93 1104	8.4	2	2 UN	INWO	UN

RAYMOND_QUARRY

93111401	93 1114	8.6	1	2 AN	POLY	UN
93111402	93 1114	8.6	2	3 UN	INWO	UN
93124101	93 1241	8.3	1	1 AN	POLY	UN
93124102	93 1241	8.3	1	1 UN	POLL	UN
93124103	93 1241	8.3	3	1 AR	INAR	UN
93001901	93 0019	10.5	1	1 UN	INWO	UN
93124201	93 1242	8.5	1	1 AN	POLY	UN
93124202	93 1242	8.5	2	1 AR	ALUT	PS
93031101	93 0311	9.2	1	1 UN	INWO	UN
93019501	93 0195	9.6	1	1 UN	INWO	UN
93019001	93 0190	9.6	1	1 UN	INWO	UN
93052701	93 0527	8.9	1	1 CN	MACK	ES
93027901	93 0279	9.6	1	1 AN	POLY	UN
93027902	93 0279	9.6	2	1 UN	POLL	UN
93046301	93 0463	15.8	1	1 UN	INDE	UN
93053901	93 0539	8.5	1	1 AR	ANOD	PS
93054101	93 0541	13.7	1	1 UN	INWO	UN
93063401	93 0634	9.5	1	1 PR	OTTO	IV
93067501	93 0675	8.8	1	1 UN	INWO	UN
93067401	93 0674	8.4	1	1 AN	POLY	UN
93069701	93 0697	8.6	1	1 UN	INWO	UN
93069801	93 0698	NL	1	1 UN	INWO	UN
93074801	93 0748	13.3	1	1 PR	OTTO	IV
93080001	93 0800	8.8	1	1 UN	INWO	UN
93090301	93 0903	8.0	1	1 UN	INWO	UN
93094101	93 0941	9.5	1	1 UN	INWO	UN
93146301	93 1463	8.8	1	1 UN	INWO	UN
93146901	93 1469	8.8	1	1 UN	INWO	UN
93072201	93 0722	14.8	1	1 MO	HAPL	EV
93082301	93 0823	15.6	1	1 MO	HAPL	EV
93088201	93 0882	14.8	1	1 MO	HAPL	EV
93038901	93 0389	15.8	1	1 MO	HAPL	EV
93157201	93 1572	11.6	1	1 MO	HAPL	EV
93088301	93 0883	15.5	1	1 MO	HAPL	EV
93105301	93 1053	13.3	1	1 MO	HAPL	EV
93007201	93 0072	8.1	1	2 BR	MICR	ES
93010501	93 0105	8.4	1	2 BR	MICR	ES
93156901	93 1569	11.9	1	13 MO	HAPL	EV
93156101	93 1561	11.6	1	2 BR	MICR	ES
93022501	93 0225	8.2	1	1 BR	MICR	ES
93121501	93 1215	11.6	1	4 BR	MICR	ES
93036001	93 0360	8.8	1	1 BR	NISU	ES
93042601	93 0426	8.3	1	1 BR	MICR	ES
93108801	93 1088	8.4	1	1 AR	NECT	PS
93160901	93 1609	10.1	1	1 AR	NECT	PS
93046401	93 0464	10.2	1	1 AR	NECT	PS
93052301	93 0523	14.8	1	1 AR	OPAB	PS
93040401	93 0404	10.3	1	1 AR	OPAB	PS
93052101	93 0521	9.5	1	1 AR	OPAB	PS
93052401	93 0524	14.8	1	1 AR	OPAB	PS
93079301	93 0793	9.6	1	3 UN	POLL	UN

RAYMOND_QUARRY

93097901	93 0979	13.2	1	1 AR	SEAM	PS
93034901	93 0349	9.8	1	1 AR	SEAM	PS
93088401	93 0884	15.5	1	1 AR	SEAM	PS
93078601	93 0786	9.2	1	6 UN	POLL	UN
93129101	93 1291	13.5	1	1 AR	SEAM	PS
93145801	93 1458	13.4	1	1 AR	SEAM	PS
93160701	93 1607	9.9	1	1 AR	SEAM	PS
93010601	93 0106	9.8	1	1 AL	MARG	AA
93010602	93 0106	9.8	2	1 UN	INWO	UN
93002601	93 0026	10.0	1	1 AL	MARG	AA
93015801	93 0158	10.8	1	1 AL	MARG	AA
93019701	93 0197	10.7	1	1 AL	MARG	AA
93019702	93 0197	10.7	2	1 UN	INWO	UN
93004201	93 0042	9.3	1	1 UN	INDE	UN
93087201	93 0872	12.6	1	1 PO	VAUX	ES
93091901	93 0919	9.5	1	1 AL	MARG	AA
93091902	93 0919	9.5	2	1 UN	INWO	UN
93157001	93 1570	8.8	1	1 PO	HAMP	ES
93098001	93 0980	13.2	1	1 UN	INDE	UN
93144001	93 1440	8.4	1	1 AL	INAL	UN
93029601	93 0296	9.0	1	1 UN	INTU	UN
93029602	93 0296	9.0	2	3 AN	POLY	UN
93029603	93 0296	9.0	3	1 UN	INWO	UN
93035401	93 0354	8.8	1	1 UN	INWO	UN
93034501	93 0345	8.4	1	1 UN	INTU	UN
93034502	93 0345	8.4	2	6 UN	INWO	UN
93039801	93 0398	10.2	1	1 UN	INTU	UN
93039802	93 0398	10.2	2	4 UN	POLL	UN
93039803	93 0398	10.2	3	1 AR	ALUT	PS
93053201	93 0532	8.8	1	1 UN	INTU	UN
93053202	93 0532	8.8	1	1 UN	INDE	UN
93053401	93 0534	10.2	1	1 UN	INTU	UN
93053402	93 0534	10.2	2	3 UN	INDE	UN
93061901	93 0619	8.5	1	1 UN	INTU	UN
93061902	93 0619	8.5	2	3 UN	INWO	UN
93066301	93 0663	8.2	1	1 VA	SHEL	SH
93063601	93 0636	8.4	1	1 UN	INTU	UN
93063602	93 0636	8.4	2	1 UN	INWO	UN
93123101	93 1231	8.4	1	1 UN	INTU	UN
93123102	93 1231	8.4	2	1 AN	POLY	UN
93123103	93 1231	8.4	0	2 UN	INWO	UN
93145501	93 1455	8.3	1	1 UN	INDE	UN
93141101	93 1411	8.4	1	1 UN	INTU	UN
93141102	93 1411	8.4	2	3 AR	ALUT	PS
93004401	93 0044	10.5	1	1 PR	OTTO	IV
93001801	93 0018	9.3	1	1 PR	OTTO	IV
93001601	93 0016	11.0	1	1 UN	INDE	UN
93004601	93 0046	13.0	1	1 PR	OTTO	IV
93007901	93 0079	8.2	1	1 AL	INAL	UN
93009001	93 0090	9.9	1	1 UN	INDE	UN
93009301	93 0093	10.7	1	1 AR	LEAN	NB

RAYMOND_QUARRY

93021601	93 0216	10.3	1	1 UN	INWO	UN
93026601	93 0266	8.2	1	1 EC	GOGI	ES
93030401	93 0304	8.7	1	1 CN	JELL	PS
93031401	93 0314	9.5	1	1 UN	INDE	UN
93030201	93 0302	11.0	1	1 UN	INDE	UN
93030202	93 0302	11.0	2	1 AR	AGNO	PS
93030601	93 0306	9.2	1	1 UN	INTU	UN
93030602	93 0306	9.2	2	1 UN	INWO	UN
93039601	93 0396	8.9	1	1 UN	INDE	UN
93072501	93 0725	10.0	1	1 PO	CHAN	ES
93063101	93 0631	8.1	1	1 UN	INDE	UN
93055901	93 0559	9.0	1	1 AN	POLY	UN
93074601	93 0746	13.2	1	1 UN	INDE	UN
93063701	93 0637	8.9	1	1 PO	CHAN	ES
93080601	93 0806	10.3	1	1 UN	INDE	UN
93077701	93 0777	10.2	1	1 CN	JELL	PS
93078501	93 0785	13.0	1	1 UN	INDE	UN
93085601	93 0856	10.3	1	1 UN	INDE	UN
93080901	93 0809	13.2	1	2 PO	CHAN	ES
93080902	93 0809	13.2	2	23 UN	POLL	UN
93080903	93 0809	13.2	3	1 AR	APPF	PS
93080904	93 0809	13.2	4	2 AR	PAGE	PS
93087801	93 0878	15.4	1	1 AR	SIDN	NB
93091401	93 0914	9.3	1	1 UN	INDE	UN
93111701	93 1117	8.9	1	1 UN	INDE	UN
93097601	93 0976	14.2	1	1 UN	INDE	UN
93108001	93 1080	8.3	1	1 CN	JELL	PS
93108002	93 1080	8.3	2	1 MO	HAPL	EV
93091701	93 0917	9.0	1	1 UN	INTU	UN
93091702	93 0917	9.0	2	1 AN	POLY	UN
93107501	93 1075	8.5	1	1 PR	OTTO	IV
93107502	93 1075	8.5	2	1 AR	LEAN	NB
93107503	93 1075	8.5	3	1 PO	VAUX	ES
93107504	93 1075	8.5	4	1 UN	INDE	UN
93119701	93 1197	13.4	1	1 UN	INDE	UN
93123501	93 1235	9.5	1	1 UN	INDE	UN
93131301	93 1313	13.3	1	1 UN	INDE	UN
93131302	93 1313	13.3	2	1 VA	SHEL	SH
93147401	93 1474	10.3	1	1 CN	JELL	PS
93147402	93 1474	10.3	2	1 AR	LEAN	NB
93147403	93 1474	10.3	3	4 AR	ALUT	PS
93143501	93 1435	13.7	1	1 EC	CREE	EV
93165601	93 1656	8.8	1	1 UN	INDE	UN
93143201	93 1432	13.7	1	1 UN	INDE	UN
93008801	93 0088	9.7	1	10 PR	OTTO	IV
93007701	93 0077	9.1	1	1 PR	OTTO	IV
93009501	93 0095	9.6	1	1 PR	OTTO	IV
93009502	93 0095	9.6	2	2 AR	ALUT	PS
93009801	93 0098	10.7	1	1 PR	OTTO	IV
93003701	93 0037	10.0	1	2 PR	OTTO	IV
93010301	93 0103	8.7	1	1 PR	OTTO	IV

RAYMOND_QUARRY

93011501	93 0115	10.9	1	1 PR	OTTO	IV
93011502	93 0115	10.9	2	1 UN	INDE	UN
93014801	93 0148	9.7	1	1 PR	OTTO	IV
93014802	93 0148	9.7	2	1 PR	OTTO	IV
93014803	93 0148	9.7	3	1 UN	INDE	UN
93014804	93 0148	9.7	4	2 UN	POLL	UN
93014701	93 0147	9.0	1	1 PR	OTTO	IV
93015001	93 0150	8.8	1	1 PR	OTTO	IV
93015002	93 0150	8.8	2	1 PO	CHAN	ES
93011701	93 0117	8.5	1	1 PR	OTTO	IV
93014101	93 0141	8.7	1	1 PR	OTTO	IV
93014102	93 0141	8.7	2	1 AR	ALUT	PS
93016301	93 0163	9.2	1	17 PR	OTTO	IV
93017101	93 0171	9.7	1	2 PR	OTTO	IV
93020101	93 0201	8.6	1	2 PR	OTTO	IV
93020701	93 0207	8.6	1	1 PR	OTTO	IV
93020702	93 0207	8.6	2	1 PO	VAUX	ES
93019401	93 0194	10.0	1	1 PR	OTTO	IV
93017501	93 0175	8.7	1	1 PR	OTTO	IV
93017502	93 0175	8.7	2	1 AR	ALUT	PS
93021901	93 0219	9.0	1	2 PR	OTTO	IV
93022201	93 0222	8.2	1	1 PR	OTTO	IV
93022301	93 0223	9.0	1	1 PR	OTTO	IV
93022302	93 0223	9.0	2	1 UN	INDE	UN
93023101	93 0231	9.0	1	1 PR	OTTO	IV
93023102	93 0231	9.0	2	1 AR	APPF	PS
93023201	93 0232	10.9	1	2 PR	OTTO	IV
93023202	93 0232	10.9	2	2 UN	POLL	UN
93023301	93 0233	NL	1	1 PR	OTTO	IV
93024801	93 0248	9.2	1	1 UN	INTU	UN
93024802	93 0248	9.2	2	1 UN	INWO	UN
93025101	93 0251	9.9	1	1 PR	OTTO	IV
93028501	93 0285	9.8	1	1 PR	OTTO	IV
93026101	93 0261	8.6	1	1 PR	OTTO	IV
93028801	93 0288	9.9	1	1 PR	OTTO	IV
93029201	93 0292	10.3	1	1 PR	OTTO	IV
93029202	93 0292	10.3	2	1 AR	LEAN	NB
93029801	93 0298	10.0	1	1 PR	OTTO	IV
93030801	93 0308	NL	1	1 PR	OTTO	IV
93034601	93 0346	9.6	1	3 PR	OTTO	IV
93034602	93 0346	9.6	2	1 PR	OTTO	IV
93032001	93 0320	9.2	1	1 PR	OTTO	IV
93034701	93 0347	9.8	1	1 PR	OTTO	IV
93035901	93 0359	16.1	1	2 PR	OTTO	IV
93035902	93 0359	16.1	2	1 AR	PAGE	PS
93035301	93 0353	8.5	1	2 PR	OTTO	IV
93035302	93 0353	8.5	2	1 PO	VAUX	ES
93035303	93 0353	8.5	3	2 PO	CHAN	ES
93035304	93 0353	8.5	4	1 BR	MICR	ES
93036201	93 0362	9.2	1	1 PR	OTTO	IV
93036202	93 0362	9.2	2	1 AR	ALUT	PS

RAYMOND_QUARRY

93036203	93 0362	9.2	3	2 AR	ANOM	PS
93036401	93 0364	8.9	1	2 PR	OTTO	IV
93036402	93 0364	8.9	2	1 AR	ALUT	PS
93036403	93 0364	8.9	3	1 AR	LEAN	NB
93036701	93 0367	9.7	1	1 PR	OTTO	IV
93037301	93 0373	10.8	1	27 PR	OTTO	IV
93037401	93 0374	8.4	1	7 PR	OTTO	IV
93037402	93 0374	8.4	2	1 AR	LEAN	NB
93038301	93 0383	10.1	1	6 PR	OTTO	IV
93038401	93 0384	9.4	1	6 PR	OTTO	IV
93044501	93 0445	8.4	1	1 PR	OTTO	IV
93050901	93 0509	10.7	1	1 PR	OTTO	IV
93040201	93 0402	9.9	1	2 PR	OTTO	IV
93050101	93 0501	8.2	1	4 PR	OTTO	IV
93050102	93 0501	8.2	2	1 AR	LEAN	NB
93038302	93 0383	10.1	2	1 PR	OTTO	IV
93052601	93 0526	8.1	1	1 PR	OTTO	IV
93052201	93 0522	9.3	1	1 PR	OTTO	IV
93052202	93 0522	9.3	2	1 MO	HAPL	EV
93052602	93 0526	8.1	2	1 MO	HAPL	EV
93049601	93 0496	8.4	1	1 PR	OTTO	IV
93041301	93 0413	10.8	1	3 PR	OTTO	IV
93041302	93 0413	10.8	2	2 AR	PAGE	PS
93041303	93 0413	10.8	3	15 AR	ALUT	PS
93039701	93 0397	9.9	1	1 PR	OTTO	IV
93044601	93 0446	10.7	1	5 PR	OTTO	IV
93040001	93 0400	9.4	1	2 PR	OTTO	IV
93041501	93 0415	9.0	1	1 PR	OTTO	IV
93041502	93 0415	9.0	2	3 MO	HAPL	EV
93040101	93 0401	9.4	1	1 PR	OTTO	IV
93044401	93 0444	8.4	1	1 PR	OTTO	IV
93053701	93 0537	9.2	1	3 PR	OTTO	IV
93053702	93 0537	9.2	2	1 AR	WAPT	NB
93053001	93 0530	8.9	1	1 PR	OTTO	IV
93055001	93 0550	9.8	1	3 PR	OTTO	IV
93053301	93 0533	10.2	1	2 PR	OTTO	IV
93053302	93 0533	10.2	2	1 PO	VAUX	ES
93016701	93 0167	10.2	1	1 AR	TUZO	UN
93016702	93 0167	10.2	2	3 PR	OTTO	IV
93025401	93 0254	9.4	1	1 AR	TUZO	UN
93025402	93 0254	9.4	2	1 PR	OTTO	IV
93025403	93 0254	9.4	3	1 PO	VAUX	ES
93027701	93 0277	8.8	1	1 AR	TUZO	UN
93027702	93 0277	8.8	2	5 AR	LEAN	NB
93036101	93 0361	9.7	1	1 AR	TUZO	UN
93038801	93 0388	9.8	1	1 AR	CARN	UN
93048801	93 0488	11.0	1	1 AR	TUZO	UN
93054201	93 0542	8.8	1	1 AR	TUZO	UN
93075001	93 0750	8.1	1	1 AR	TUZO	UN
93061101	93 0611	8.2	1	1 AR	TUZO	UN
93069001	93 0690	8.8	1	1 AR	TUZO	UN

RAYMOND_QUARRY

93077901	93 0779	9.5	1	1 AR	TUZO	UN
93077902	93 0779	9.5	2	1 PR	OTTO	IV
93077903	93 0779	9.5	3	2 PO	VAUX	ES
93078401	93 0784	8.4	1	1 AR	TUZO	UN
93080201	93 0802	9.7	1	1 AR	TUZO	UN
93089401	93 0894	8.0	1	1 AR	TUZO	UN
93085301	93 0853	9.3	1	1 AR	TUZO	UN
93095701	93 0957	9.6	1	1 AR	TUZO	UN
93099601	93 0996	8.3	1	2 AR	TUZO	UN
93099701	93 0997	8.5	1	1 AR	TUZO	UN
93108201	93 1082	8.3	1	1 AR	TUZO	UN
93155701	93 1557	7.9	1	1 AR	TUZO	UN
93155702	93 1557	7.9	2	1 PR	OTTO	IV
93155703	93 1557	7.9	3	1 AR	LEAN	NB
93161001	93 1610	10.0	1	1 AR	TUZO	UN
93018301	93 0183	8.9	1	1 AR	WAPT	NB
93060202	93 0602	8.7	2	1 PR	OTTO	IV
93060203	93 0602	8.7	3	1 UN	POLL	UN
93060204	93 0602	8.7	4	1 AR	AGNO	PS
93133801	93 1338	9.2	1	1 AR	LEAN	NB
93042701	93 0427	10.0	1	1 AR	CHAP	EV
93015901	93 0159	9.2	1	1 AR	CHAP	EV
93054901	93 0549	8.8	1	1 AR	CHAP	EV
93005301	93 0053	9.0	1	1 AR	ORYC	EV
93006001	93 0060	8.1	1	1 AR	KOOT	EV
93001401	93 0014	10.5	1	1 AR	OLEN	EV
93001402	93 0014	10.5	2	4 MO	HAPL	EV
93001403	93 0014	10.5	3	1 AR	ISOX	PS
93001404	93 0014	10.5	4	1 AR	ALUT	PS
93004101	93 0041	9.0	1	1 AR	CHAP	EV
93090901	93 0909	8.0	1	1 AR	CHAP	EV
93020301	93 0203	10.0	1	1 AR	OLEN	EV
93020302	93 0203	10.0	2	1 MO	HAPL	EV
93020303	93 0203	10.0	3	1 PR	SELK	IV
93020304	93 0203	10.0	4	1 UN	POLL	UN
93021101	93 0211	10.0	1	1 AR	OLEN	EV
93035201	93 0352	9.7	1	1 AR	OLEN	EV
93035202	93 0352	9.7	2	2 AR	SIDN	NB
93035203	93 0352	9.7	3	1 AR	HURD	PS
93030001	93 0300	8.2	1	2 AR	OLEN	EV
93030002	93 0300	8.2	2	4 HE	TUBU	ES
93030003	93 0300	8.2	3	1 PO	VAUX	ES
93030004	93 0300	8.2	4	1 BR	MICR	ES
93045301	93 0453	9.8	1	1 AR	OLEN	EV
93045302	93 0453	9.8	2	1 PR	OTTO	IV
93055501	93 0555	10.3	1	1 AR	OLEN	EV
93055502	93 0555	10.3	2	1 AR	SIDN	NB
93055503	93 0555	10.3	3	10 BR	MICR	ES
93070301	93 0703	8.3	1	1 AR	OLEN	EV
93078201	93 0782	9.8	1	1 AR	OLEN	EV
93094301	93 0943	10.0	1	1 AR	OLEN	EV

RAYMOND_QUARRY

93094302	93 0943	10.0	2	1 PO	HAZE	ES
93155201	93 1552	10.3	1	1 AR	OLEN	EV
93062801	93 0628	10.0	1	2 AR	OLEN	EV
93062802	93 0628	10.0	2	1 PR	OTTO	IV
93029301	93 0293	9.2	1	1 AR	PAGE	PS
93029302	93 0293	9.2	2	2 PR	OTTO	IV
93060301	93 0603	8.9	1	1 AR	ORYC	EV
93121201	93 1212	17.2	1	1 AR	ELRA	EV
93121101	93 1211	17.2	1	1 AR	ELRA	EV
93121001	93 1210	17.2	1	1 AR	ORYC	EV
93057601	93 0576	NL	1	1 AR	CHAP	EV
93000201	93 0002	8.6	1	1 PO	CHAN	ES
93000701	93 0007	8.6	1	1 PO	CHAN	ES
93030901	93 0309	8.7	1	3 PO	CHAN	ES
93030902	93 0309	8.7	2	1 UN	POLL	UN
93040701	93 0407	8.3	1	5 PO	CHAN	ES
93040702	93 0407	8.3	2	1 AR	ALUT	PS
93041101	93 0411	8.4	1	1 PO	CHAN	ES
93041102	93 0411	8.4	2	1 AR	ISOX	PS
93041103	93 0411	8.4	3	1 AR	LEAN	NB
93041104	93 0411	8.4	4	3 UN	POLL	UN
93061701	93 0617	8.5	1	1 PO	CHAN	ES
93054401	93 0544	8.4	1	1 PO	CHAN	ES
93053301	93 0533	9.0	1	5 PO	CHAN	ES
93053302	93 0533	9.0	2	1 HE	TUBU	ES
93053303	93 0533	9.0	3	2 BR	MICR	ES
93066201	93 0662	9.0	1	5 PO	CHAN	ES
93066202	93 0662	9.0	2	1 PO	VAUX	ES
93042201	93 0422	8.9	1	1 PO	CHAN	ES
93067101	93 0671	9.0	1	2 PO	CHAN	ES
93067102	93 0671	9.0	2	1 PO	VAUX	ES
93067201	93 0672	8.5	1	1 PO	CHAN	ES
93067202	93 0672	8.5	2	1 PO	VAUX	ES
93068601	93 0686	8.4	1	2 PO	CHAN	ES
93087001	93 0870	12.9	1	2 PO	CHAN	ES
93074101	93 0741	13.6	1	1 PO	CHAN	ES
93087701	93 0877	12.7	1	1 PO	CHAN	ES
93096301	93 0963	9.6	1	1 PO	CHAN	ES
93101501	93 1015	13.2	1	1 PO	CHAN	ES
93088501	93 0885	15.6	1	1 PO	CHAN	ES
93087901	93 0879	8.9	1	1 PO	CHAN	ES
93105801	93 1058	13.2	1	1 PO	CHAN	ES
93105802	93 1058	13.2	2	8 UN	POLL	UN
93105803	93 1058	13.2	3	1 AR	OLEN	EV
93101801	93 1018	13.6	1	2 PO	CHAN	ES
93106101	93 1061	12.8	1	2 PO	CHAN	ES
93106201	93 1062	13.1	1	1 PO	CHAN	ES
93106301	93 1063	12.9	1	2 PO	CHAN	ES
93112401	93 1124	8.8	1	1 PO	CHAN	ES
93112402	93 1124	8.8	2	1 PO	VAUX	ES
93112403	93 1124	8.8	3	1 AR	LEAN	NB

RAYMOND_QUARRY

93112404	93 1124	8.8	4	4 AR	ALUT	PS
93109001	93 1090	8.4	1	1 PO	CHAN	ES
93109002	93 1090	8.4	2	1 MO	HAPL	EV
93109601	93 1096	8.4	1	1 PO	CHAN	ES
93107301	93 1073	8.4	1	1 PO	CHAN	ES
93113401	93 1134	8.3	1	3 PO	CHAN	ES
93113402	93 1134	8.3	2	1 PO	VAUX	ES
93116601	93 1166	8.3	1	16 PO	CHAN	ES
93116602	93 1166	8.3	2	7 PO	VAUX	ES
93116603	93 1166	8.3	3	1 AR	ANOM	PS
93121801	93 1218	16.7	1	1 PO	CHAN	ES
93116301	93 1163	8.8	1	1 PO	CHAN	ES
93115301	93 1153	8.7	1	3 PO	CHAN	ES
93115302	93 1153	8.7	2	1 AR	ANOM	PS
93115303	93 1153	8.7	3	1 PO	VAUX	ES
93133501	93 1335	13.0	1	1 PO	CHAN	ES
93133502	93 1335	13.0	2	1 PO	VAUX	ES
93141201	93 1412	8.3	1	1 BR	MICR	ES
93139301	93 1393	11.7	1	2 PO	CHAN	ES
93139302	93 1393	11.7	2	5 UN	POLL	UN
93141202	93 1412	8.3	2	1 PO	CHAN	ES
93143001	93 1430	8.2	1	1 PO	CHAN	ES
93143002	93 1430	8.2	2	1 AR	ANOM	PS
93143003	93 1430	8.2	3	1 PO	VAUX	ES
93143301	93 1433	8.2	1	8 PO	CHAN	ES
93143302	93 1433	8.2	2	1 BR	MICR	ES
93143101	93 1431	8.2	1	5 PO	CHAN	ES
93143102	93 1431	8.2	2	1 PO	VAUX	ES
93143103	93 1431	8.2	3	3 BR	MICR	ES
93144101	93 1441	8.2	1	3 PO	CHAN	ES
93144102	93 1441	8.2	2	1 PO	VAUX	ES
93155801	93 1558	8.1	1	1 PO	CHAN	ES
93155802	93 1558	8.1	2	1 EC	CREE	EV
93001701	93 0017	10.1	1	1 PO	CHOI	ES
93004501	93 0045	9.3	1	1 PO	CHOI	ES
93145201	93 1452	8.2	1	2 PO	CHAN	ES
93145202	93 1452	8.2	2	1 PO	VAUX	ES
93145203	93 1452	8.2	3	1 BR	MICR	ES
93145204	93 1452	8.2	4	1 PR	OTTO	IV
93021501	93 0215	11.1	1	1 PO	HAMP	ES
93041201	93 0412	8.8	1	7 PO	CHOI	ES
93041202	93 0412	8.8	2	1 AR	SIDN	NB
93031501	93 0315	9.3	1	5 PO	CHOI	ES
93035001	93 0350	8.6	1	51 PO	CHOI	ES
93013601	93 0136	8.7	1	8 PO	CHOI	ES
93013602	93 0136	8.7	2	3 PO	VAUX	ES
93044001	93 0440	8.6	1	58 PO	CHOI	ES
93044002	93 0440	8.6	2	3 PO	VAUX	ES
93044003	93 0440	8.6	3	1 AR	SIDN	NB
93066401	93 0664	8.4	1	9 PO	CHOI	ES
93066401	93 0664	8.4	1	9 PO	CHOI	ES

RAYMOND_QUARRY

93062501	93 0625	9.5	1	1 PO	CHOI	ES
93046501	93 0465	15.7	1	1 PO	CHOI	ES
93067601	93 0676	8.4	1	1 PO	CHOI	ES
93073401	93 0734	8.4	1	520 PO	CHOI	ES
93165501	93 1655	8.6	1	9 PO	CHOI	ES
93088601	93 0886	16.7	1	2 PO	CHOI	ES
93088602	93 0886	16.7	2	1 BR	MICR	ES
93094901	93 0949	8.5	1	1 PO	CHOI	ES
93094902	93 0949	8.5	2	1 PO	VAUX	ES
93094903	93 0949	8.5	3	1 BR	MICR	ES
93156201	93 1562	11.6	1	1 PO	CHOI	ES
93156202	93 1562	11.6	2	1 MO	HAPL	EV
93111501	93 1115	8.9	1	1 PO	CHAN	ES
93039401	93 0394	9.0	1	2 PO	HAZE	ES
93039402	93 0394	9.0	2	2 PO	VAUX	ES
93128401	93 1284	13.7	1	1 PO	HAZE	ES
93004301	93 0043	9.1	1	1 AR	ANOM	PS
93017201	93 0172	8.6	1	1 AR	ANOM	PS
93008101	93 0081	8.2	1	1 AR	ANOM	PS
93025301	93 0253	9.2	1	2 AR	ANOM	PS
93138801	93 1388	20+	1	1 AR	ANOM	PS
93073901	93 0739	9.7	1	1 PR	OTTO	IV
93013701	93 0137	8.6	1	1 AR	ANOM	PS
93016901	93 0169	11.0	1	1 AR	ANOM	PS
93015201	93 0152	8.8	1	2 AR	ANOM	PS
93016801	93 0168	9.8	1	2 AR	ANOM	PS
93030101	93 0301	8.4	1	1 AR	ANOM	PS
93017001	93 0170	9.0	1	1 AR	ANOM	PS
93019201	93 0192	10.2	1	2 AR	ANOM	PS
93019202	93 0192	10.2	2	1 AR	LEAN	NB
93019901	93 0199	9.7	1	1 AR	ANOM	PS
93019902	93 0199	9.7	2	1 AR	SIDN	NB
93025001	93 0250	8.8	1	2 AR	ANOM	PS
93035101	93 0351	9.2	1	1 AR	ANOM	PS
93035102	93 0351	9.2	2	1 AR	PAGE	PS
93055801	93 0558	8.9	1	1 AR	ANOM	PS
93055802	93 0558	8.9	2	1 PR	OTTO	IV
93040901	93 0409	NL	1	1 AR	SIDN	NB
93060001	93 0600	9.0	1	1 AR	ANOM	PS
93060002	93 0600	9.0	2	1 AR	SIDN	NB
93060003	93 0600	9.0	3	15 UN	POLL	UN
93061001	93 0610	8.9	1	1 AR	ANOM	PS
93099801	93 0998	12.0	1	1 AR	ANOM	PS
93099802	93 0998	12.0	2	1 MO	HAPL	EV
93099803	93 0998	12.0	3	1 AR	SIDN	NB
93116701	93 1167	8.3	1	1 AR	ANOM	PS
93128401	93 1284	13.7	2	1 AR	ISOX	PS
93156801	93 1568	8.8	1	1 PO	HAZE	ES
93055701	93 0557	9.2	1	1 PO	HAMP	ES
93002001	93 0020	10.3	1	1 PO	TAKA	ES
93030301	93 0303	9.2	1	1 PO	TAKA	ES

RAYMOND_QUARRY

93044101	93 0441	9.1	1	5 PO	TAKA	ES
93082801	93 0828	9.2	1	1 PO	TAKA	ES
93022401	93 0224	8.9	1	37 UN	POLL	UN
93022402	93 0224	8.9	2	1 BR	MICR	ES
93022403	93 0224	8.9	3	1 BR	MICR	ES
93022404	93 0224	8.9	4	3 PO	VAUX	ES
93022405	93 0224	8.9	5	1 PO	CHAN	ES
93022901	93 0229	9.8	1	2 PO	VAUX	ES
93039101	93 0391	9.6	1	1 PO	VAUX	ES
93035701	93 0357	9.0	1	1 PO	VAUX	ES
93041601	93 0416	9.7	1	2 PO	VAUX	ES
93062101	93 0621	10.8	1	1 PO	VAUX	ES
93066601	93 0666	9.2	1	1 PO	VAUX	ES
93066602	93 0666	9.2	2	1 BR	MICR	ES
93060701	93 0607	9.2	1	3 PO	VAUX	ES
93093501	93 0935	8.0	1	5 PO	VAUX	ES
93082201	93 0822	10.0	1	1 PO	VAUX	ES
93093401	93 0934	9.6	1	1 PO	VAUX	ES
93093402	93 0934	9.6	2	1 PR	OTTO	IV
93101401	93 1014	8.7	1	6 PO	VAUX	ES
93101402	93 1014	8.7	2	6 PO	CHAN	ES
93101403	93 1014	8.7	3	2 BR	MICR	ES
93101404	93 1014	8.7	4	1 AR	ISOX	PS
93101405	93 1014	8.7	5	1 EC	CREE	EV
93101406	93 1014	8.7	6	1 HE	TUBU	ES
93101407	93 1014	8.7	7	1 MO	HAPL	EV
93017901	93 0179	10.0	1	1 AR	SIDN	NB
93020501	93 0205	8.7	1	1 AR	SIDN	NB
93020601	93 0206	8.7	1	1 AR	SIDN	NB
93020602	93 0206	8.7	2	1 PO	VAUX	ES
93021201	93 0212	10.7	1	1 AR	SIDN	NB
93022001	93 0220	9.4	1	1 AR	SIDN	NB
93022601	93 0226	9.3	1	1 AR	SIDN	NB
93025201	93 0252	9.2	1	1 AR	SIDN	NB
93023001	93 0230	9.0	1	1 AR	SIDN	NB
93025601	93 0256	8.4	1	1 AR	SIDN	NB
93025801	93 0258	9.2	1	1 AR	SIDN	NB
93027501	93 0275	9.3	1	2 AR	SIDN	NB
93027502	93 0275	9.3	2	147 PO	CHOI	ES
93027503	93 0275	9.3	3	3 PO	VAUX	ES
93028701	93 0287	9.0	1	1 AR	SIDN	NB
93029401	93 0294	8.8	1	1 AR	SIDN	NB
93029402	93 0294	8.8	2	1 AR	HURD	PS
93029403	93 0294	8.8	3	1 PO	VAUX	ES
93029101	93 0291	9.0	1	1 AR	SIDN	NB
93035501	93 0355	15.8	1	1 AR	SIDN	NB
93039301	93 0393	8.9	1	1 AR	SIDN	NB
93039302	93 0393	8.9	2	1 PO	VAUX	ES
93039001	93 0390	10.4	1	1 AR	SIDN	NB
93029501	93 0295	9.2	1	1 AR	SIDN	NB
93041401	93 0414	8.7	1	1 AR	SIDN	NB

RAYMOND_QUARRY

93042001	93 0420	8.9	1	1 AR	SIDN	NB
93044301	93 0443	15.6	1	1 AR	SIDN	NB
93044701	93 0447	8.8	1	1 AR	SIDN	NB
93046701	93 0467	8.2	1	1 AR	SIDN	NB
93051501	93 0515	8.6	1	1 AR	SIDN	NB
93051601	93 0516	15.7	1	1 AR	SIDN	NB
93053801	93 0538	8.8	1	1 AR	SIDN	NB
93057101	93 0571	8.4	1	1 AR	SIDN	NB
93060801	93 0608	10.0	1	1 AR	SIDN	NB
93060101	93 0601	8.9	1	1 AR	SIDN	NB
93060102	93 0601	8.9	2	1 PO	VAUX	ES
93061201	93 0612	8.4	1	1 AR	SIDN	NB
93061202	93 0612	8.4	2	3 PR	OTTO	IV
93061203	93 0612	8.4	3	1 PO	VAUX	ES
93061401	93 0614	9.2	1	1 AR	SIDN	NB
93061402	93 0614	9.2	2	1 PO	VAUX	ES
93065201	93 0652	8.4	1	1 AR	SIDN	NB
93065901	93 0659	8.2	1	1 AR	SIDN	NB
93065701	93 0657	8.2	1	1 AR	SIDN	NB
93069401	93 0694	9.1	1	1 AR	SIDN	NB
93066901	93 0669	8.8	1	1 AR	SIDN	NB
93066902	93 0669	8.8	2	1 VA	SHEL	SH
93066101	93 0661	8.8	1	1 AR	SIDN	NB
93068901	93 0689	NL	1	1 AR	SIDN	NB
93068902	93 0689	NL	2	1 PO	VAUX	ES
93069501	93 0695	NL	1	1 AR	SIDN	NB
93069502	93 0695	NL	2	44 PO	CHOI	ES
93068801	93 0688	NL	1	1 AR	SIDN	NB
93068802	93 0688	NL	2	2 PO	VAUX	ES
93069601	93 0696	9.2	1	1 CN	JELL	PS
93069602	93 0696	9.2	2	1 BR	NISU	ES
93069603	93 0696	9.2	3	1 HE	TUBU	ES
93076001	93 0760	10.1	1	1 AR	SIDN	NB
93076002	93 0760	10.1	2	1 VA	SHEL	SH
93078001	93 0780	9.6	1	1 AR	SIDN	NB
93080801	93 0808	8.8	1	1 AR	SIDN	NB
93078801	93 0788	8.8	1	1 AR	SIDN	NB
93088701	93 0887	9.5	1	1 AR	SIDN	NB
93089101	93 0891	9.9	1	1 AR	SIDN	NB
93090001	93 0900	8.1	1	1 AR	SIDN	NB
93095501	93 0955	8.9	1	1 AR	SIDN	NB
93095502	93 0955	8.9	2	1 PO	VAUX	ES
93095801	93 0958	8.4	1	1 AR	SIDN	NB
93095802	93 0958	8.4	2	2 PO	VAUX	ES
93095601	93 0956	8.8	1	1 AR	SIDN	NB
93095901	93 0959	8.8	1	1 AR	SIDN	NB
93097801	93 0978	11.8	1	1 AR	SIDN	NB
93097701	93 0977	8.4	1	1 AR	SIDN	NB
93097301	93 0973	8.4	1	1 AR	SIDN	NB
93097302	93 0973	8.4	2	2 PR	OTTO	IV
93099901	93 0999	8.6	1	1 AR	SIDN	NB

RAYMOND_QUARRY

93099902	93 0999	8.6	2	22 UN	POLL	UN
93103701	93 1037	9.0	1	1 AR	SIDN	NB
93103702	93 1037	9.0	2	1 PO	VAUX	ES
93105401	93 1054	13.2	1	1 AR	SIDN	NB
93107401	93 1074	8.4	1	1 AR	SIDN	NB
93107402	93 1074	8.4	2	2 PO	VAUX	ES
93110701	93 1107	8.2	1	2 AR	SIDN	NB
93115201	93 1152	8.0	1	1 AR	SIDN	NB
93111001	93 1110	8.6	1	2 AR	SIDN	NB
93111002	93 1110	8.6	2	1 PO	VAUX	ES
93108701	93 1087	8.5	1	1 AR	SIDN	NB
93111101	93 1111	8.5	1	1 AR	SIDN	NB
93116001	93 1160	8.6	1	1 AR	SIDN	NB
93119401	93 1194	8.4	1	1 AR	SIDN	NB
93118001	93 1180	8.8	1	1 AR	SIDN	NB
93118002	93 1180	8.8	2	1 PO	VAUX	ES
93117101	93 1171	8.3	1	1 AR	SIDN	NB
93120401	93 1204	9.0	1	1 AR	SIDN	NB
93120701	93 1207	9.0	1	1 AR	SIDN	NB
93120702	93 1207	9.0	2	1 AR	SIDN	NB
93128301	93 1283	13.8	1	1 AR	SIDN	NB
93139101	93 1391	13.0	1	1 AR	SIDN	NB
93140901	93 1409	8.8	1	1 AR	SIDN	NB
93140902	93 1409	8.8	2	1 PO	VAUX	ES
93140903	93 1409	8.8	3	8 UN	POLL	UN
93160101	93 1601	10.3	1	1 AR	SIDN	NB
93169601	93 1696	8.6	1	1 AR	SIDN	NB
93000501	93 0005	8.6	1	1 AR	LEAN	NB
93000502	93 0005	8.6	2	1 AR	LEAN	NB
93000503	93 0005	8.6	3	1 PO	VAUX	ES
93000504	93 0005	8.6	4	1 AR	LEAN	NB
93001101	93 0011	10.3	1	1 AR	LEAN	NB
93001201	93 0012	9.3	1	1 AR	LEAN	NB
93001301	93 0013	10.5	1	1 AR	LEAN	NB
93001302	93 0013	10.5	2	1 AR	ALUT	PS
93001303	93 0013	10.5	3	1 PO	VAUX	ES
93002101	93 0021	10.2	1	1 AR	LEAN	NB
93005401	93 0054	10.3	1	1 AR	LEAN	NB
93005901	93 0059	8.7	1	1 AR	LEAN	NB
93007601	93 0076	8.7	1	1 AR	LEAN	NB
93002301	93 0023	10.0	1	1 AR	LEAN	NB
93002302	93 0023	10.0	2	1 UN	INDE	UN
93002303	93 0023	10.0	3	1 AR	ALUT	PS
93008701	93 0087	8.2	1	1 AR	LEAN	NB
93008901	93 0089	8.6	1	1 AR	LEAN	NB
93008301	93 0083	8.0	1	1 AR	LEAN	NB
93009201	93 0092	8.6	1	1 AR	LEAN	NB
93009101	93 0091	8.2	1	1 AR	LEAN	NB
93009601	93 0096	8.2	1	1 AR	LEAN	NB
93009602	93 0096	8.2	2	1 BR	MICR	ES
93010001	93 0100	8.2	1	2 AR	LEAN	NB

RAYMOND_QUARRY

93010002	93 0100	8.2	2	1 AR	ANOM	PS
93010003	93 0100	8.2	3	1 PR	OTTO	IV
93010004	93 0100	8.2	4	10 AR	ALUT	PS
93010005	93 0100	8.2	5	1 AR	PAGE	PS
93010006	93 0100	8.2	6	1 AR	AGNO	PS
93010801	93 0108	9.0	1	1 AR	LEAN	NB
93010802	93 0108	9.0	2	1 PR	OTTO	IV
93011301	93 0113	9.1	1	1 AR	LEAN	NB
93011901	93 0119	8.7	1	1 AR	LEAN	NB
93012301	93 0123	8.7	1	1 AR	LEAN	NB
93012302	93 0123	8.7	2	1 PR	OTTO	IV
93012303	93 0123	8.7	3	1 AR	ALUT	PS
93012201	93 0122	9.4	1	1 AR	LEAN	NB
93012202	93 0122	9.4	2	1 BR	MICR	ES
93014901	93 0149	10.0	1	1 AR	LEAN	NB
93014902	93 0149	10.0	2	1 PR	OTTO	IV
93015701	93 0157	8.7	1	1 AR	LEAN	NB
93015702	93 0157	8.7	2	2 UN	POLL	UN
93015703	93 0157	8.7	3	12 UN	INDE	UN
93016001	93 0160	9.3	1	3 AR	LEAN	NB
93016101	93 0161	9.8	1	1 AR	LEAN	NB
93016102	93 0161	9.8	2	2 PO	VAUX	ES
93016201	93 0162	8.6	1	1 AR	LEAN	NB
93017401	93 0174	8.9	1	1 AR	LEAN	NB
93018101	93 0181	8.6	1	1 AR	LEAN	NB
93018102	93 0181	8.6	2	1 HE	TUBU	ES
93018201	93 0182	8.4	1	1 AR	LEAN	NB
93019301	93 0193	9.6	1	1 AR	LEAN	NB
93019801	93 0198	9.6	1	1 AR	LEAN	NB
93020201	93 0202	9.8	1	1 AR	LEAN	NB
93020401	93 0204	9.8	1	1 AR	LEAN	NB
93020901	93 0209	8.6	1	1 AR	LEAN	NB
93020902	93 0209	8.6	2	1 AR	ALUT	PS
93021001	93 0210	8.6	1	1 AR	LEAN	NB
93021101	93 0211	9.0	1	1 AR	LEAN	NB
93022101	93 0221	NL	1	2 AR	LEAN	NB
93023501	93 0235	8.2	1	1 AR	LEAN	NB
93023601	93 0236	10.2	1	1 AR	LEAN	NB
93023401	93 0234	9.0	1	1 AR	LEAN	NB
93023402	93 0234	9.0	2	1 PO	VAUX	ES
93023403	93 0234	9.0	3	1 AN	TUBU	ES
93026001	93 0260	8.4	1	1 AR	LEAN	NB
93026002	93 0260	8.4	2	4 AR	ALUT	PS
93026003	93 0260	8.4	3	1 UN	POLL	UN
93026201	93 0262	8.7	1	1 AR	LEAN	NB
93026301	93 0263	8.2	1	1 AR	LEAN	NB
93026401	93 0264	8.6	1	1 AR	LEAN	NB
93026402	93 0264	8.6	2	1 AR	WAPT	NB
93028401	93 0284	NL	1	4 AR	LEAN	NB
93028402	93 0284	NL	2	1 AR	ALUT	PS
93028301	93 0283	8.4	1	1 AR	LEAN	NB

RAYMOND_QUARRY

93029701	93 0297	8.3	1	1 AR	LEAN	NB
93031801	93 0318	8.9	1	1 AR	LEAN	NB
93031802	93 0318	8.9	2	1 AR	ISOX	PS
93035601	93 0356	8.3	1	1 AR	LEAN	NB
93036501	93 0365	9.4	1	1 AR	LEAN	NB
93036601	93 0366	9.2	1	1 AR	LEAN	NB
93036602	93 0366	9.2	2	1 AR	LEAN	NB
93036603	93 0366	9.2	3	1 AR	LEAN	NB
93036604	93 0366	9.2	4	1 BR	MICR	ES
93036605	93 0366	9.2	5	1 AR	ALUT	PS
93037001	93 0370	9.2	1	1 AR	HABB	NB
93039901	93 0399	9.0	1	3 AR	LEAN	NB
93041001	93 0410	9.7	1	1 AR	LEAN	NB
93041002	93 0410	9.7	2	1 PR	OTTO	IV
93040301	93 0403	8.9	1	1 AR	LEAN	NB
93041701	93 0417	8.5	1	3 AR	LEAN	NB
93041901	93 0419	8.9	1	1 AR	LEAN	NB
93043801	93 0438	15.8	1	1 AR	LEAN	NB
93044801	93 0448	15.7	1	1 AR	LEAN	NB
93045001	93 0450	15.8	1	1 AR	LEAN	NB
93045501	93 0455	9.5	1	2 AR	LEAN	NB
93045502	93 0455	9.5	2	1 EC	ECHM	ES
93046801	93 0468	9.4	1	1 AR	LEAN	NB
93046802	93 0468	9.4	2	1 PR	OTTO	IV
93046901	93 0469	8.4	1	1 AR	LEAN	NB
93046902	93 0469	8.4	2	1 AR	SIDN	NB
93046903	93 0469	8.4	3	1 UN	INDE	UN
93047701	93 0477	8.0	1	2 AR	LEAN	NB
93047702	93 0477	8.0	2	1 AR	ISOX	PS
93047703	93 0477	8.0	3	1 PO	VAUX	ES
93047704	93 0477	8.0	4	6 AR	ALUT	PS
93048501	93 0485	8.2	1	1 AR	LEAN	NB
93048502	93 0485	8.2	2	1 AR	INAR	UN
93048601	93 0486	8.1	1	1 AR	LEAN	NB
93048701	93 0487	11.0	1	1 AR	LEAN	NB
93048702	93 0487	11.0	2	1 PR	OTTO	IV
93049301	93 0493	8.1	1	1 AR	LEAN	NB
93049302	93 0493	8.1	2	1 PR	OTTO	IV
93048901	93 0489	8.0	1	1 AR	LEAN	NB
93048902	93 0489	8.0	2	1 AR	LEAN	NB
93048903	93 0489	8.0	3	1 UN	POLL	UN
93049001	93 0490	7.9	1	1 AR	LEAN	NB
93049002	93 0490	7.9	2	1 PO	VAUX	ES
93049501	93 0495	8.1	1	1 AR	LEAN	NB
93049502	93 0495	8.1	2	2 AR	ALUT	PS
93049401	93 0494	10.0	1	1 AR	LEAN	NB
93050201	93 0502	8.0	1	2 AR	LEAN	NB
93050301	93 0503	9.6	1	1 AR	LEAN	NB
93050302	93 0503	9.6	2	1 UN	POLL	UN
93051001	93 0510	8.5	1	1 AR	LEAN	NB
93051002	93 0510	8.5	2	2 PR	OTTO	IV

RAYMOND_QUARRY

93051101	93 0511	8.4	1	1 AR	LEAN	NB
93051301	93 0513	9.6	1	1 AR	LEAN	NB
93051701	93 0517	10.2	1	1 AR	LEAN	NB
93051801	93 0518	8.4	1	1 AR	LEAN	NB
93051401	93 0514	8.4	1	1 AR	LEAN	NB
93051402	93 0514	8.4	2	1 PR	OTTO	IV
93051403	93 0514	8.4	3	1 PO	VAUX	ES
93051404	93 0514	8.4	4	1 VA	SHEL	SH
93053101	93 0531	8.6	1	3 AR	LEAN	NB
93053102	93 0531	8.6	2	1 AR	ISOX	PS
93053103	93 0531	8.6	3	1 AR	PAGE	PS
93053104	93 0531	8.6	4	1 UN	INDE	UN
93140301	93 1403	20+	1	2 AR	ANOM	PS
93000101	93 0001	8.6	1	1 AR	APPF	PS
93118201	93 1182	8.2	1	1 AR	ANOM	PS
93001501	93 0015	10.3	1	1 AR	APPF	PS
93002401	93 0024	10.0	1	1 AR	APPF	PS
93005101	93 0051	10.7	1	2 AR	APPF	PS
93005801	93 0058	8.8	1	1 AR	APPF	PS
93008001	93 0080	9.2	1	1 AR	APPF	PS
93036301	93 0363	8.8	1	1 AR	APPF	PS
93036302	93 0363	8.8	2	1 PO	CHOI	ES
93036303	93 0363	8.8	3	1 PO	VAUX	ES
93076201	93 0762	8.5	1	1 AR	SIDN	NB
93076202	93 0762	8.5	2	1 UN	INDE	UN
93076203	93 0762	8.5	3	1 AR	APPF	PS
93044201	93 0442	10.5	1	1 AR	APPF	PS
93044202	93 0442	10.5	2	1 AR	AGNO	PS
93089201	93 0892	11.2	1	1 AR	APPF	PS
93047801	93 0478	9.7	1	1 AR	APPF	PS
93094701	93 0947	8.5	1	1 AR	APPF	PS
93101601	93 1016	13.6	1	2 AR	APPF	PS
93101602	93 1016	13.6	2	1 PO	CHAN	ES
93098101	93 0981	13.2	1	1 AR	APPF	PS
93098102	93 0981	13.2	2	1 BR	MICR	ES
93005701	93 0057	9.3	1	1 AR	HURD	PS
93005001	93 0050	12.7	1	1 AR	HURD	PS
93005002	93 0050	12.7	2	1 AR	ISOX	PS
93010701	93 0107	8.6	1	1 AR	HURD	PS
93011401	93 0114	8.5	1	1 AR	HURD	PS
93011402	93 0114	8.5	2	2 AR	LEAN	NB
93011403	93 0114	8.5	3	1 AR	EMER	EV
93057701	93 0577	8.4	1	1 PR	OTTO	IV
93055201	93 0552	8.4	1	3 PR	OTTO	IV
93060501	93 0605	8.8	1	4 PR	OTTO	IV
93056201	93 0562	8.8	1	2 PR	OTTO	IV
93056202	93 0562	8.8	2	2 AR	LEAN	NB
93056203	93 0562	8.8	3	20 UN	POLL	UN
93065601	93 0656	9.0	1	1 PR	OTTO	IV
93066501	93 0665	8.8	1	3 PR	OTTO	IV
93066502	93 0665	8.8	2	3 AR	ALUT	PS

RAYMOND_QUARRY

93066503	93 0665	8.8	3	1 AR	PAGE	PS
93069301	93 0693	10.5	1	1 PR	OTTO	IV
93068501	93 0685	NL	1	3 PR	OTTO	IV
93067701	93 0677	8.9	1	1 PR	OTTO	IV
93067801	93 0678	9.0	1	2 PR	OTTO	IV
93169901	93 1699	8.6	1	1 UN	ICHN	UN
93070101	93 0701	NL	1	1 PR	OTTO	IV
93070201	93 0702	9.4	1	1 PR	OTTO	IV
93070401	93 0704	8.6	1	1 PR	OTTO	IV
93070501	93 0705	NL	1	1 PR	OTTO	IV
93074201	93 0742	8.3	1	1 PR	OTTO	IV
93074202	93 0742	8.3	2	1 AR	LEAN	NB
93074203	93 0742	8.3	3	3 AR	ALUT	PS
93074301	93 0743	8.2	1	1 PR	OTTO	IV
93076301	93 0763	8.5	1	3 PR	OTTO	IV
93074901	93 0749	8.6	1	1 PR	OTTO	IV
93077601	93 0776	10.2	1	2 PR	OTTO	IV
93077602	93 0776	10.2	2	5 AR	ALUT	PS
93077301	93 0773	9.9	1	1 PR	OTTO	IV
93079701	93 0797	8.3	1	2 PR	OTTO	IV
93079101	93 0791	10.1	1	2 PR	OTTO	IV
93079102	93 0791	10.1	1	1 AR	ALUT	PS
93079801	93 0798	10.2	1	1 PR	OTTO	IV
93079901	93 0799	10.2	1	1 PR	OTTO	IV
93079902	93 0799	10.2	2	1 AR	ALUT	PS
93080101	93 0801	10.6	1	2 PR	OTTO	IV
93082101	93 0821	9.3	1	2 PR	OTTO	IV
93082102	93 0821	9.3	2	2 AR	LEAN	NB
93082501	93 0825	9.6	1	1 PR	OTTO	IV
93082601	93 0826	9.8	1	1 PR	OTTO	IV
93083001	93 0830	10.0	1	6 PR	OTTO	IV
93083002	93 0830	10.0	2	2 UN	POLL	UN
93083501	93 0835	9.8	1	2 PR	OTTO	IV
93083502	93 0835	9.8	2	2 AR	ALUT	PS
93083401	93 0834	8.4	1	1 PR	OTTO	IV
93084501	93 0845	9.9	1	1 PR	OTTO	IV
93084502	93 0845	9.9	2	1 AR	LEAN	NB
93083701	93 0837	9.8	1	1 PR	OTTO	IV
93084001	93 0840	9.3	1	3 PR	OTTO	IV
93084801	93 0848	9.9	1	1 PR	OTTO	IV
93085901	93 0859	10.7	1	1 PR	OTTO	IV
93084101	93 0841	10.0	1	2 PR	OTTO	IV
93084102	93 0841	10.0	2	1 AR	ALUT	PS
93087601	93 0876	9.7	1	17 PR	OTTO	IV
93093001	93 0930	9.6	1	2 PR	OTTO	IV
93089601	93 0896	8.6	1	2 PR	OTTO	IV
93089602	93 0896	8.6	2	1 PO	VAUX	ES
93093901	93 0939	9.3	1	1 PR	OTTO	IV
93093902	93 0939	9.3	2	1 MO	HAPL	EV
93093903	93 0939	9.3	3	1 PR	OTTO	IV
93093101	93 0931	9.7	1	2 PR	OTTO	IV

RAYMOND_QUARRY

93093801	93 0938	8.6	1	1 PR	OTTO	IV
93096601	93 0966	NL	1	1 PR	OTTO	IV
93097001	93 0970	9.4	1	5 PR	OTTO	IV
93098201	93 0982	13.2	1	1 PR	OTTO	IV
93097201	93 0972	NL	1	2 PR	OTTO	IV
93101701	93 1017	13.2	1	3 PR	OTTO	IV
93103901	93 1039	8.7	1	1 PR	OTTO	IV
93103902	93 1039	8.7	2	3 AR	LEAN	NB
93103903	93 1039	8.7	3	1 PO	VAUX	ES
93103904	93 1039	8.7	4	1 AR	ISOX	PS
93103905	93 1039	8.7	5	1 AR	PAGE	PS
93103801	93 1038	8.7	1	4 PR	OTTO	IV
93103802	93 1038	8.7	2	1 AR	SIDN	NB
93103803	93 1038	8.7	3	1 PO	CHOI	ES
93103804	93 1038	8.7	4	1 EC	ECHM	ES
93104101	93 1041	8.8	1	1 PR	OTTO	IV
93104201	93 1042	8.8	1	1 PR	OTTO	IV
93104801	93 1048	8.8	1	1 PR	OTTO	IV
93104802	93 1048	8.8	2	1 PO	VAUX	ES
93104803	93 1048	8.8	3	2 AR	PAGE	PS
93105101	93 1051	13.2	1	1 PR	OTTO	IV
93105701	93 1057	12.9	1	1 PR	OTTO	IV
93105702	93 1057	12.9	2	1 PO	CHAN	ES
93105201	93 1052	13.2	1	1 PR	OTTO	IV
93107601	93 1076	8.4	1	5 PR	OTTO	IV
93107701	93 1077	8.3	1	1 PR	OTTO	IV
93107702	93 1077	8.3	2	1 PR	OTTO	IV
93107901	93 1079	8.3	1	3 PR	OTTO	IV
93107902	93 1079	8.3	2	1 PR	OTTO	IV
93107903	93 1079	8.3	3	1 AR	LEAN	NB
93107904	93 1079	8.3	4	1 AN	POLY	UN
93108601	93 1086	8.4	1	2 PR	OTTO	IV
93108602	93 1086	8.4	2	1 AR	ALUT	PS
93109501	93 1095	8.3	1	1 PR	OTTO	IV
93109401	93 1094	8.5	1	1 PR	OTTO	IV
93110201	93 1102	8.8	1	2 PR	OTTO	IV
93110301	93 1103	8.8	1	1 PR	OTTO	IV
93114101	93 1141	8.3	1	2 PR	OTTO	IV
93112601	93 1126	8.7	1	1 PR	OTTO	IV
93114301	93 1143	8.3	1	2 PR	OTTO	IV
93115201	93 1152	8.8	1	3 PR	OTTO	IV
93115202	93 1152	8.8	2	1 AR	ALUT	PS
93115203	93 1152	8.8	3	1 PO	CHAN	ES
93114701	93 1147	8.3	1	1 PR	OTTO	IV
93114401	93 1144	8.3	1	1 PR	OTTO	IV
93114402	93 1144	8.3	2	1 AR	LEAN	NB
93114403	93 1144	8.3	3	1 AR	APPF	PS
93114801	93 1148	8.3	1	1 PR	OTTO	IV
93114501	93 1145	8.3	1	1 PR	OTTO	IV
93114502	93 1145	8.3	2	1 AR	ANOM	PS
93115101	93 1151	8.3	1	1 PR	OTTO	IV

RAYMOND_QUARRY

93115401	93 1154	8.3	1	1 PR	OTTO	IV
93114601	93 1146	8.3	1	1 PR	OTTO	IV
93115501	93 1155	8.3	1	2 PR	OTTO	IV
93115502	93 1155	8.3	2	1 PR	OTTO	IV
93116801	93 1168	9.0	1	1 PR	OTTO	IV
93115901	93 1159	8.3	1	7 PR	OTTO	IV
93115902	93 1159	8.3	2	1 PO	CHAN	ES
93115903	93 1159	8.3	3	1 AR	ALUT	PS
93115601	93 1156	8.3	1	1 PR	OTTO	IV
93116901	93 1169	8.8	1	3 PR	OTTO	IV
93116902	93 1169	8.8	2	1 AR	ALUT	PS
93116903	93 1169	8.8	3	1 BR	NISU	ES
93116904	93 1169	8.8	4	1 UN	ICHN	UN
93116101	93 1161	9.8	1	1 PR	OTTO	IV
93117401	93 1174	8.2	1	1 PR	OTTO	IV
93117402	93 1174	8.2	2	2 AR	LEAN	NB
93118401	93 1184	8.4	1	1 PR	OTTO	IV
93119201	93 1192	13.4	1	5 PR	OTTO	IV
93120801	93 1208	16.7	1	1 PR	OTTO	IV
93121301	93 1213	10.0	1	1 PR	OTTO	IV
93119601	93 1196	8.3	1	1 PR	OTTO	IV
93119602	93 1196	8.3	2	2 AR	LEAN	NB
93121701	93 1217	9.6	1	1 PR	OTTO	IV
93122701	93 1227	9.6	1	8 PR	OTTO	IV
93122001	93 1220	9.4	1	2 PR	OTTO	IV
93122101	93 1221	8.3	1	2 PR	OTTO	IV
93122501	93 1225	8.3	1	2 PR	OTTO	IV
93122502	93 1225	8.3	2	1 AR	ANOM	PS
93122503	93 1225	8.3	3	1 AR	WAPT	NB
93122504	93 1225	8.3	4	1 UN	INDE	UN
93122505	93 1225	8.3	5	1 AR	ALUT	PS
93123201	93 1232	8.3	1	1 PR	OTTO	IV
93122201	93 1222	8.3	1	1 PR	OTTO	IV
93123301	93 1233	8.2	1	1 PR	OTTO	IV
93123701	93 1237	8.3	1	1 PR	OTTO	IV
93124301	93 1243	8.2	1	1 PR	OTTO	IV
93123901	93 1239	8.3	1	2 PR	OTTO	IV
93124701	93 1247	8.3	1	2 PR	OTTO	IV
93124601	93 1246	8.3	1	1 PR	OTTO	IV
93124602	93 1246	8.3	2	1 AR	SIDN	NB
93124801	93 1248	8.3	1	1 PR	OTTO	IV
93124401	93 1244	9.5	1	1 PR	OTTO	IV
93124402	93 1244	9.5	2	1 AR	LEAN	NB
93126401	93 1264	12.2	1	1 AR	HURD	PS
93126402	93 1264	12.2	2	2 AR	ELRA	EV
93126403	93 1264	12.2	3	1 AR	PAGE	PS
93126701	93 1267	9.5	1	1 PR	OTTO	IV
93126501	93 1265	9.5	1	1 PR	OTTO	IV
93126901	93 1269	9.6	1	1 PR	OTTO	IV
93126801	93 1268	9.5	1	2 PR	OTTO	IV
93126601	93 1266	9.5	1	1 PR	OTTO	IV

RAYMOND_QUARRY

93127101	93 1271	9.3	1	1 PR	OTTO	IV
93127301	93 1273	9.3	1	1 PR	OTTO	IV
93127001	93 1270	9.5	1	1 PR	OTTO	IV
93128001	93 1280	9.2	1	1 PR	OTTO	IV
93128002	93 1280	9.2	2	2 AR	LEAN	NB
93127501	93 1275	9.6	1	1 PR	OTTO	IV
93127201	93 1272	9.5	1	1 PR	OTTO	IV
93127401	93 1274	9.6	1	1 PR	OTTO	IV
93129601	93 1296	13.6	1	1 PR	OTTO	IV
93129602	93 1296	13.6	2	1 PO	CHAN	ES
93129701	93 1297	13.4	1	4 PR	OTTO	IV
93129702	93 1297	13.4	2	1 AR	TUZO	UN
93130901	93 1309	13.2	1	4 PR	OTTO	IV
93138901	93 1389	9.1	1	2 PR	OTTO	IV
93138902	93 1389	9.1	2	1 AR	LEAN	NB
93139501	93 1395	9.2	1	1 PR	OTTO	IV
93139401	93 1394	9.1	1	2 PR	OTTO	IV
93139402	93 1394	9.1	2	1 AR	ALUT	PS
93140101	93 1401	9.1	1	1 PR	OTTO	IV
93139601	93 1396	9.3	1	4 PR	OTTO	IV
93139602	93 1396	9.3	2	1 AR	ALUT	PS
93140601	93 1406	9.1	1	4 PR	OTTO	IV
93140701	93 1407	9.1	1	2 PR	OTTO	IV
93140702	93 1407	9.1	2	1 AR	ALUT	PS
93140501	93 1405	8.9	1	1 PR	OTTO	IV
93143401	93 1434	13.0	1	1 PR	OTTO	IV
93154801	93 1548	8.2	1	1 PR	OTTO	IV
93154802	93 1548	8.2	2	1 AR	WAPT	NB
93154803	93 1548	8.2	3	1 BR	NISU	ES
93154804	93 1548	8.2	4	1 PO	CHAN	ES
93143901	93 1439	8.4	1	2 PR	OTTO	IV
93155301	93 1553	9.1	1	1 PR	OTTO	IV
93143601	93 1436	8.2	1	1 PR	OTTO	IV
93143602	93 1436	8.2	2	1 AR	LEAN	NB
93143701	93 1437	8.6	1	1 PR	OTTO	IV
93155401	93 1554	8.1	1	1 PR	OTTO	IV
93155901	93 1559	8.8	1	1 PR	OTTO	IV
93155902	93 1559	8.8	2	1 AR	ALUT	PS
93154901	93 1549	7.9	1	2 PR	OTTO	IV
93154902	93 1549	7.9	2	1 BR	NISU	ES
93155001	93 1550	10.3	1	3 PR	OTTO	IV
93155002	93 1550	10.3	2	2 AR	ALUT	PS
93156001	93 1560	10.8	1	1 PR	OTT	IV
93156002	93 1560	10.8	2	1 AR	ALUT	PS
93156601	93 1566	9.1	1	1 PR	OTTO	IV
93157501	93 1575	10.3	1	1 PR	OTTO	IV
93160201	93 1602	9.1	1	1 PR	OTTO	IV
93160301	93 1603	9.1	1	3 PR	OTTO	IV
93160302	93 1603	9.1	2	2 MO	HELC	EV
93160303	93 1603	9.1	3	1 VA	SHEL	SH
93160601	93 1606	9.1	1	1 PR	OTTO	IV

RAYMOND_QUARRY

93160602	93 1606	9.1	2	1 AR	LEAN	NB
93160603	93 1606	9.1	3	2 AR	PAGE	PS
93161101	93 1611	9.1	1	1 PR	OTTO	IV
93160401	93 1604	9.1	1	1 PR	OTTO	IV
93161201	93 1612	8.8	1	2 PR	OTTO	IV
93161901	93 1619	9.8	1	2 PR	OTTO	IV
93162001	93 1620	10.3	1	1 PR	OTTO	IV
93168601	93 1686	9.5	1	3 PR	OTTO	IV
93168602	93 1686	9.5	2	1 AR	ALUT	PS
93168401	93 1684	9.3	1	2 PR	OTTO	IV
93168402	93 1684	9.3	2	2 AR	ALUT	PS
93168701	93 1687	9.6	1	1 PR	OTTO	IV
93168702	93 1687	9.6	2	1 AR	ALUT	PS
93168901	93 1689	9.5	1	1 PR	OTTO	IV
93169801	93 1698	9.6	1	1 PR	OTTO	IV
93169802	93 1698	9.6	2	3 AR	PAGE	PS
93169301	93 1693	NL	1	2 PR	OTTO	IV
93169101	93 1691	9.3	1	1 PR	OTTO	IV
93169201	93 1692	9.3	1	1 PR	OTTO	IV
93169202	93 1692	9.3	2	1 AR	SIDN	NB
93169203	93 1692	9.3	3	1 AR	LEAN	NB
93169701	93 1697	9.5	1	3 PR	OTTO	IV
93169401	93 1694	9.5	1	1 PR	OTTO	IV
93169402	93 1694	9.5	2	1 PR	OTTO	IV
93010201	93 0102	8.2	1	1 AR	LEAN	NB
93010202	93 0102	8.2	2	1 PR	OTTO	IV
93009701	93 0097	10.2	1	1 AR	SIDN	NB
93002801	93 0028	9.3	1	1 AR	SIDN	NB
93012101	93 0121	8.7	1	1 AR	SIDN	NB
93013801	93 0138	8.6	1	1 AR	SIDN	NB
93013901	93 0139	8.6	1	1 AR	SIDN	NB
93013902	93 0139	8.6	2	1 PO	VAUX	ES
93015601	93 0156	9.0	1	1 AR	SIDN	NB
93018001	93 0180	8.9	1	1 AR	SIDN	NB
93018002	93 0180	8.9	2	1 PO	VAUX	ES
93054501	93 0545	11.4	1	1 AR	LEAN	NB
93054601	93 0546	8.8	1	1 AR	LEAN	NB
93057501	93 0575	8.4	1	1 AR	LEAN	NB
93057502	93 0575	8.4	2	1 AR	ALUT	PS
93059301	93 0593	NL	1	1 AR	LEAN	NB
93057201	93 0572	9.0	1	1 AR	LEAN	NB
93057202	93 0572	9.0	2	2 BR	MICR	ES
93060601	93 0606	8.2	1	1 AR	LEAN	NB
93060602	93 0606	8.2	2	1 UN	POLL	UN
93062001	93 0620	9.7	1	1 AR	LEAN	NB
93062002	93 0620	9.7	2	1 PR	OTTO	IV
93061501	93 0615	9.8	1	1 AR	LEAN	NB
93061502	93 0615	9.8	2	1 AR	LEAN	NB
93062301	93 0623	9.0	1	1 AR	LEAN	NB
93065301	93 0653	8.7	1	1 AR	LEAN	NB
93061601	93 0616	8.5	1	1 AR	LEAN	NB

RAYMOND_QUARRY

93061602	93 0616	8.5	2	1 PR	OTTO	IV
93061801	93 0618	9.0	1	1 AR	LEAN	NB
93061802	93 0618	9.0	2	4 UN	POLL	UN
93066001	93 0660	8.6	1	1 AR	LEAN	NB
93066801	93 0668	8.2	1	1 AR	LEAN	NB
93067001	93 0670	8.8	1	2 AR	LEAN	NB
93067901	93 0679	11.4	1	1 AR	LEAN	NB
93070601	93 0706	9.7	1	1 AR	LEAN	NB
93071601	93 0716	8.4	1	2 AR	LEAN	NB
93072601	93 0726	NL	1	1 AR	LEAN	NB
93072701	93 0727	8.5	1	1 AR	LEAN	NB
93074001	93 0740	8.6	1	5 AR	LEAN	NB
93075901	93 0759	8.1	1	1 AR	LEAN	NB
93075801	93 0758	10.3	1	2 AR	LEAN	NB
93075802	93 0758	10.3	2	1 AR	ALUT	PS
93076401	93 0764	8.0	1	1 AR	LEAN	NB
93076402	93 0764	8.0	2	1 AR	ALUT	PS
93078101	93 0781	8.5	1	1 AR	LEAN	NB
93077801	93 0778	9.2	1	1 AR	LEAN	NB
93077802	93 0778	9.2	2	1 PO	VAUX	ES
93077401	93 0774	8.5	1	1 AR	LEAN	NB
93076501	93 0765	10.0	1	1 AR	LEAN	NB
93078701	93 0787	8.0	1	1 AR	LEAN	NB
93079201	93 0792	8.9	1	1 AR	LEAN	NB
93079202	93 0792	8.9	2	1 AR	ANOM	PS
93079203	93 0792	8.9	3	1 AR	ALUT	PS
93079401	93 0794	8.5	1	1 AR	LEAN	NB
93079402	93 0794	8.5	2	1 AR	SIDN	NB
93079601	93 0796	9.0	1	1 AR	LEAN	NB
93079602	93 0796	9.0	2	1 AR	ALUT	PS
93080401	93 0804	9.8	1	1 AR	LEAN	NB
93082901	93 0829	15.9	1	1 AR	LEAN	NB
93080701	93 0807	8.2	1	1 AR	LEAN	NB
93080702	93 0807	8.2	2	1 PO	VAUX	ES
93080703	93 0807	8.2	3	8 AR	ALUT	PS
93080704	93 0807	8.2	4	3 BR	MICR	ES
93081001	93 0810	10.8	1	1 AR	LEAN	NB
93083101	93 0831	8.2	1	2 AR	LEAN	NB
93083301	93 0833	10.2	1	2 AR	LEAN	NB
93083302	93 0833	10.2	2	1 PR	OTTO	IV
93083303	93 0833	10.2	3	1 AR	HURD	PS
93083304	93 0833	10.2	4	2 AR	ALUT	PS
93084301	93 0843	9.9	1	1 AR	LEAN	NB
93085201	93 0852	9.9	1	1 AR	LEAN	NB
93085202	93 0852	9.9	2	1 AR	LEAN	NB
93084601	93 0846	9.8	1	1 AR	LEAN	NB
93083901	93 0839	9.2	1	1 AR	LEAN	NB
93083902	93 0839	9.2	2	1 UN	POLL	UN
93087101	93 0871	9.4	1	1 AR	LEAN	NB
93087102	93 0871	9.4	2	1 AR	LEAN	NB
93087103	93 0871	9.4	3	3 PO	VAUX	ES

RAYMOND_QUARRY

93087104	93 0871	9.4	4	1 AR	WAPT	NB
93085701	93 0857	10.3	1	1 AR	LEAN	NB
93085801	93 0858	9.9	1	1 AR	LEAN	NB
93087301	93 0873	15.6	1	1 AR	LEAN	NB
93089801	93 0898	9.5	1	1 AR	LEAN	NB
93089802	93 0898	9.5	2	4 AR	ALUT	PS
93089001	93 0890	9.5	1	1 AR	LEAN	NB
93089002	93 0890	9.5	2	1 PR	OTTO	IV
93089003	93 0890	9.5	3	1 AR	ISOX	PS
93089901	93 0899	9.3	1	1 AR	LEAN	NB
93090101	93 0901	8.2	1	1 AR	LEAN	NB
93090102	93 0901	8.2	2	1 PO	VAUX	ES
93090103	93 0901	8.2	3	1 UN	POLL	UN
93090401	93 0904	9.0	1	1 AR	LEAN	NB
93091101	93 0911	8.2	1	1 AR	LEAN	NB
93090201	93 0902	8.1	1	1 AR	LEAN	NB
93092701	93 0927	NL	1	1 AR	LEAN	NB
93092702	93 0927	NL	2	2 AR	ALUT	PS
93092101	93 0921	8.2	1	2 AR	LEAN	NB
93093301	93 0933	9.8	1	1 AR	LEAN	NB
93096001	93 0960	9.3	1	1 AR	LEAN	NB
93096002	93 0960	9.3	2	2 UN	POLL	UN
93096003	93 0960	9.3	3	1 AR	ALUT	PS
93094201	93 0942	13.9	1	1 AR	LEAN	NB
93096101	93 0961	9.6	1	1 AR	LEAN	NB
93096102	93 0961	9.6	2	1 PR	OTTO	IV
93101201	93 1012	8.4	1	1 AR	LEAN	NB
93100401	93 1004	7.9	1	1 AR	LEAN	NB
93100402	93 1004	7.9	2	1 AR	ALUT	PS
93104001	93 1040	8.8	1	1 AR	LEAN	NB
93100301	93 1003	8.4	1	1 AR	LEAN	NB
93109801	93 1098	8.3	1	1 AR	LEAN	NB
93109201	93 1092	8.4	1	1 AR	LEAN	NB
93108101	93 1081	8.3	1	1 AR	LEAN	NB
93108102	93 1081	8.3	2	1 AR	APPF	PS
93110901	93 1109	8.2	1	1 AR	LEAN	NB
93110902	93 1109	8.2	2	1 MO	HELC	EV
93110903	93 1109	8.2	3	1 MO	HAPL	EV
93110904	93 1109	8.2	4	1 PO	VAUX	ES
93111201	93 1112	8.5	1	2 AR	LEAN	NB
93111202	93 1112	8.5	2	1 AR	LEAN	NB
93113301	93 1133	8.3	1	1 AR	LEAN	NB
93111601	93 1116	NL	1	1 AR	LEAN	NB
93113601	93 1136	8.4	1	1 AR	LEAN	NB
93113901	93 1139	8.8	1	1 AR	LEAN	NB
93113902	93 1139	8.8	2	1 PR	OTTO	IV
93114001	93 1140	8.3	1	1 AR	LEAN	NB
93114901	93 1149	8.3	1	1 AR	LEAN	NB
93116201	93 1162	9.8	1	1 AR	LEAN	NB
93115701	93 1157	8.3	1	1 AR	LEAN	NB
93117901	93 1179	8.6	1	1 AR	LEAN	NB

RAYMOND_QUARRY

93117902	93 1179	8.6	2	1 UN	POLL	UN
93117701	93 1177	9.8	1	1 AR	LEAN	NB
93118701	93 1187	8.0	1	1 AR	LEAN	NB
93118501	93 1185	8.1	1	1 AR	LEAN	NB
93119001	93 1190	8.6	1	1 PO	VAUX	ES
93119801	93 1198	8.8	1	1 AR	LEAN	NB
93120601	93 1206	8.3	1	1 AR	LEAN	NB
93122901	93 1229	8.3	1	1 AR	LEAN	NB
93122902	93 1229	8.3	2	1 AR	LEAN	NB
93120901	93 1209	10.8	1	1 AR	LEAN	NB
93120001	93 1200	13.4	1	1 AR	LEAN	NB
93123001	93 1230	8.3	1	1 AR	LEAN	NB
93123401	93 1234	9.4	1	1 AR	LEAN	NB
93123801	93 1238	9.4	1	1 AR	LEAN	NB
93124001	93 1240	8.3	1	1 AR	LEAN	NB
93123601	93 1236	9.4	1	1 AR	LEAN	NB
93125101	93 1251	8.3	1	1 AR	LEAN	NB
93127801	93 1278	NL	1	1 AR	LEAN	NB
93145001	93 1450	8.2	1	1 AR	LEAN	NB
93145002	93 1450	8.2	2	2 AR	LEAN	NB
93145003	93 1450	8.2	3	1 CN	JELL	PS
93145004	93 1450	8.2	4	1 AR	WAPT	NB
93145005	93 1450	8.2	5	1 PO	VAUX	ES
93145006	93 1450	8.2	6	1 AR	AGNO	PS
93155101	93 1551	10.3	1	1 AR	LEAN	NB
93155102	93 1551	10.3	2	1 PO	VAUX	ES
93145701	93 1457	8.8	1	1 AR	LEAN	NB
93155601	93 1556	10.6	1	1 AR	LEAN	NB
93156701	93 1567	10.6	1	1 AR	LEAN	NB
93157101	93 1571	10.5	1	1 AR	LEAN	NB
93160501	93 1605	9.1	1	1 AR	LEAN	NB
93160502	93 1605	9.1	2	2 PR	OTTO	IV
93160503	93 1605	9.1	3	1 AR	PAGE	PS
93160801	93 1608	10.3	1	1 AR	LEAN	NB
93161301	93 1613	10.2	1	1 AR	LEAN	NB
93162101	93 1621	9.3	1	1 AR	LEAN	NB
93165301	93 1653	8.8	1	1 AR	LEAN	NB
93168301	93 1683	9.6	1	1 AR	LEAN	NB
93168801	93 1688	9.6	1	1 AR	LEAN	NB
93168802	93 1688	9.6	2	1 UN	INDE	UN
93010901	93 0109	9.8	1	1 AR	LEAN	NB
93053601	93 0536	8.8	1	1 AR	LEAN	NB
93015101	93 0151	8.6	1	1 AR	LEAN	NB
93015102	93 0151	8.6	2	1 UN	POLL	UN
93015103	93 0151	8.6	3	1 AR	AGNO	PS
93036901	93 0369	8.7	1	1 AR	LEAN	NB
93054301	93 0543	10.2	1	1 AR	LEAN	NB
93057301	93 0573	9.0	1	1 AR	LEAN	NB
93116401	93 1164	9.8	1	1 AR	LEAN	NB
93093701	93 0937	9.2	1	1 AR	LEAN	NB
93093702	93 0937	9.2	2	1 UN	INWO	UN

RAYMOND_QUARRY

93110001	93 1100	8.3	1	1 AR	BRAN	NB
93090801	93 0908	8.1	1	1 AR	ANOD	PS
93008501	93 0085	9.6	1	1 AR	ODAR	PS
93008502	93 0085	9.6	2	1 PO	VAUX	ES
93110101	93 1101	8.4	1	1 AR	ODAR	PS
93110102	93 1101	8.4	2	1 PR	OTTO	IV
93080501	93 0805	10.6	1	1 AR	LEAN	NB
93091901	93 0919	9.5	1	1 AL	MARG	AA
93091902	93 0919	9.5	2	1 UN	INWO	UN
93063901	93 0639	8.2	1	4 BR	MICR	ES
93063902	93 0639	8.2	2	1 HE	TUBU	ES
93007301	93 0073	8.2	1	1 BR	MICR	ES
93007302	93 0073	8.2	2	1 HE	TUBU	ES
93048401	93 0484	8.5	1	1 PO	VAUX	ES
93058101	93 0581	8.2	1	1 AR	OLEN	EV
93058102	93 0581	8.2	2	1 PO	VAUX	ES
93096901	93 0969	8.9	1	1 AR	SIDN	NB
93096902	93 0969	8.9	2	1 UN	POLL	UN
93009901	93 0099	8.2	1	1 AR	OPAB	PS
93009902	93 0099	8.2	2	1 AR	ORYC	EV
93052101	93 0521	9.5	1	1 AR	OPAB	PS
93011101	93 0111	8.5	1	1 AR	ISOX	PS
93075501	93 0755	8.8	1	7 AR	PRIS	ES
93054801	93 0548	8.8	1	1 AR	LEAN	NB
93027001	93 0270	9.2	1	1 AR	SIDN	NB
93031001	93 0310	14.0	1	1 AR	ALAL	NB
93097501	93 0975	11.5	1	1 AR	ALAL	NB
93140401	93 1404	20+	1	1 AR	ALAL	NB
93003601	93 0036	9.9	1	1 CT	CTEN	PS
93007101	93 0071	9.7	1	1 CT	CTEN	PS
93056401	93 0564	10.2	1	1 CT	CTEN	PS
93075101	93 0751	10.3	1	1 CT	CTEN	PS
93161401	93 1614	10.0	1	1 CT	CTEN	PS
93056301	93 0563	9.6	1	1 AR	EMER	EV
93024501	93 0245	9.2	1	1 AR	NARA	EV
93037501	93 0375	8.6	1	1 PR	OTTO	IV
91001701	91 0017	10.6	1	11 PO	CHOI	ES
91001801	91 0018	BASE	1	1 PR	OTTO	IV
91001901	91 0019	10.0	1	1 AR	LEAN	NB
91002301	91 0023	10.6	1	1 AR	ISOX	PS
91002101	91 0021	12.0	1	1 AR	TUZO	UN
91002401	91 0024	10.3	1	1 PO	VAUX	ES
91002601	91 0026	10.2	1	1 EC	ECHM	ES
91002602	91 0026	10.2	2	1 HE	TUBU	ES
91002901	91 0029	HI	1	1 AR	SIDN	NB
91002902	91 0029	HI	2	1 VA	SHEL	SH
91002801	91 0028	10.8	1	1 UN	INDE	UN
91002701	91 0027	10.2	1	1 AR	INAR	UN
91003501	91 0035	10.6	1	1 AR	ISOX	PS
91003001	91 0030	10.3	1	1 AR	APPF	PS
91003601	91 0036	10.6	1	1 BR	MICR	ES

RAYMOND_QUARRY

91004201	91 0042	10.6	1	8 PR	OTTO	IV
91004202	91 0042	10.6	2	1 AR	LEAN	NB
91003401	91 0034	10.5	1	1 AR	LEAN	NB
91003301	91 0033	10.6	1	1 AR	ISOX	PS
91004001	91 0040	10.8	1	1 AR	INAR	UN
91003701	91 0037	11.0	1	1 UN	INWO	UN
91003901	91 0039	10.5	1	1 UN	INDE	UN
91004101	91 0041	11.0	1	1 AR	LEAN	NB
91003801	91 0038	7.4	1	1 AR	ANOM	PS
91004301	91 0043	10.6	1	1 PO	VAUX	ES
91004401	91 0044	11.0	1	1 AR	WAPT	NB
91004601	91 0046	10.3	1	1 AR	OLEN	EV
91004801	91 0048	10.2	1	1 AR	HURD	PS
91004701	91 0047	10.3	1	1 AR	TUZO	UN
91005401	91 0054	7.4	1	1 UN	INWO	UN
91005101	91 0051	10.3	1	1 AR	HURD	PS
91005201	91 0052	10.0	1	2 PR	OTTO	IV
91004901	91 0049	10.8	1	1 AR	SIDN	NB
91005701	91 0057	10.6	1	1 AR	NARA	EV
91005601	91 0056	10.0	1	1 AR	SIDN	NB
91005501	91 0055	10.2	1	1 PR	OTTO	IV
91005301	91 0053	10.2	1	1 AR	HURD	PS
91005302	91 0053	10.2	2	1 AR	LEAN	NB
91005901	91 0059	HI	1	2 AR	INAR	UN
91005902	91 0059	HI	1	27 AR	PAGE	PS
91006001	91 0060	10.3	1	1 PR	OTTO	IV
91006101	91 0061	10.6	1	1 AR	INAR	UN
91006201	91 0062	9.6	1	1 PR	OTTO	IV
91006301	91 0063	11.1	1	1 UN	INDE	UN
91006501	91 0065	10.1	1	1 AR	APPF	PS
91006601	91 0066	10.4	1	1 AR	LEAN	NB
91006701	91 0067	HI	1	2 AR	SIDN	NB
91006702	91 0067	HI	2	12 AR	PAGE	PS
91006801	91 0068	10.0	1	1 PR	OTTO	IV
91006802	91 0068	10.0	2	1 AR	LEAN	NB
91007301	91 0073	10.0	1	1 PR	OTTO	IN
91007501	91 0075	10.6	1	1 AR	ISOX	PS
91007201	91 0072	10.5	1	1 AR	ORYC	EV
91007401	91 0074	10.4	1	1 AR	LEAN	NB
91007101	91 0071	10.6	1	1 CT	CTEN	PS
91007102	91 0071	10.6	2	1 AR	PAGE	PS
91007001	91 0070	10.3	1	1 UN	INDE	UN
91007601	91 0076	12.0	1	1 PO	CHAN	ES
91007901	91 0079	10.5	1	11 PR	OTTO	IV
91007701	91 0077	10.1	1	2 AR	APPF	PS
91007702	91 0077	10.1	2	1 BR	NISU	ES
91007801	91 0078	HI	1	1 AR	APPF	PS
91008001	91 0080	9.4	1	1 AR	HURD	PS
91008101	91 0081	10.5	1	1 AR	HURD	PS
91008201	91 0082	9.6	1	2 PR	OTTO	IV
91027301	91 0273	9.7	1	1 AR	LEAN	NB

RAYMOND_QUARRY

91027501	91 0275	8.9	1	2 PR	OTTO	IV
91027502	91 0275	8.9	1	2 PR	OTTO	IV
91027502	91 0275	8.9	2	1 AR	ISOX	PS
91027601	91 0276	9.7	1	1 CN	JELL	PS
91027801	91 0278	9.3	1	1 AR	LEAN	NB
91027901	91 0279	9.3	1	1 AR	LEAN	NB
91027701	91 0277	9.0	1	5 PO	VAUX	ES
91027702	91 0277	9.0	2	5 PR	OTTO	IV
91029501	91 0295	9.3	1	3 PR	OTTO	IV
91029502	91 0295	9.3	2	1 AR	LEAN	NB
91029801	91 0298	9.4	1	1 AR	LEAN	NB
91029601	91 0296	9.3	1	1 AR	LEAN	NB
91029701	91 0297	10.0	1	1 AR	LEAN	NB
91029201	91 0292	9.1	1	2 PR	OTTO	IV
91029301	91 0293	9.1	1	1 AR	ANOM	PS
91029302	91 0293	9.1	2	4 UN	POLL	UN
91029401	91 0294	10.2	1	2 PR	OTTO	IV
91029402	91 0294	10.2	2	24 PR	OTTO	IV
91029403	91 0294	10.2	3	5 UN	POLL	UN
91029001	91 0290	9.3	1	1 AR	INAR	UN
91028901	91 0289	8.7	1	1 AR	LEAN	NB
91028701	91 0287	8.7	1	1 AR	LEAN	NB
91029101	91 0291	9.0	1	1 AR	HURD	PS
91028801	91 0288	8.7	1	2 PR	OTTO	IV
91028001	91 0280	14.7	1	1 AR	APPF	PS
91028101	91 0281	9.1	1	1 AR	INAR	UN
91028201	91 0282	9.3	1	1 AR	LEAN	NB
91028401	91 0284	9.0	1	1 PO	CHOI	ES
91028601	91 0286	9.3	1	1 AR	ODAR	PS
91028602	91 0286	9.3	2	1 PO	CHAN	ES
91028501	91 0285	8.7	1	1 AR	LEAN	NB
91028301	91 0283	8.5	1	1 AR	LEAN	NB
91028302	91 0283	8.5	2	1 UN	INWO	UN
91029901	91 0299	10.1	1	1 AR	LEAN	NB
91030001	91 0300	9.8	1	1 AR	LEAN	NB
91030101	91 0301	14.7	1	1 AR	INAR	UN
91030401	91 0304	10.5	1	1 AR	LEAN	NB
91031301	91 0313	9.3	1	1 AR	LEAN	NB
91031302	91 0313	9.3	2	1 PO	VAUX	ES
91031303	91 0313	9.3	3	1 PO	HAZE	ES
91030301	91 0303	10.2	1	1 AR	LEAN	NB
91030201	91 0302	10.5	1	1 PO	TAKA	ES
91031501	91 0315	9.0	1	1 AR	SEAM	PS
91031401	91 0314	10.5	1	1 AR	SEAM	PS
91031201	91 0312	9.8	1	1 AR	LEAN	NB
91031701	91 0317	9.7	1	1 AR	LEAN	NB
91032201	91 0322	10.1	1	1 AR	LEAN	NB
91032101	91 0321	10.0	1	1 AR	LEAP	NB
91032001	91 0320	9.6	1	1 AR	LEAN	NB
91031901	91 0319	8.9	1	1 AR	ORYC	EV
91031902	91 0319	8.9	2	1 UN	POLL	UN

RAYMOND_QUARRY

91032301	91 0323	9.0	1	1 AR	LEAN	NB
91031801	91 0318	10.5	1	1 PO	CHAN	ES
91032701	91 0327	9.5	1	1 AR	OLEN	EV
91032601	91 0326	8.7	1	1 AR	LEAN	NB
91032602	91 0326	8.7	2	1 PR	OTTO	IV
91032501	91 0325	9.0	1	1 AR	HURD	PS
91032901	91 0329	9.5	1	1 PO	VAUX	ES
91032801	91 0328	10.5	1	1 AR	APPF	PS
91033101	91 0331	14.8	1	1 AR	INAR	UN
91033001	91 0330	9.2	1	1 CN	JELL	PS
91034101	91 0341	9.6	1	1 AR	OLEN	EV
91034201	91 0342	10.5	1	1 PR	OTTO	IV
91034001	91 0340	10.5	1	1 AR	ORYC	EV
91034002	91 0340	10.5	2	1 UN	POLL	UN
91034501	91 0345	10.5	1	1 AR	LEAN	NB
91034401	91 0344	10.5	1	1 PR	OTTO	IV
91034301	91 0343	10.5	1	1 PR	OTTO	IV
91034801	91 0348	13.0	1	1 PO	CHAN	ES
91034601	91 0346	9.0	1	2 PR	OTTO	IV
91034602	91 0346	9.0	2	1 AR	LEAN	NB
91034901	91 0349	8.9	1	1 PO	VAUX	ES
91035001	91 0350	12.5	1	1 AR	APPF	PS
91035101	91 0351	9.6	1	1 AR	HELM	EV
91035201	91 0352	9.1	1	1 AR	SIDN	NB
91035202	91 0352	9.1	2	1 AR	HURD	PS
91035901	91 0359	10.5	1	1 PR	OTTO	IV
91035401	91 0354	13.0	1	1 AR	HURD	PS
91035301	91 0353	10.2	1	1 AR	LEAN	NB
91035501	91 0355	16.5	1	1 AR	LEAN	NB
91035701	91 0357	9.3	1	1 AR	LEAN	NB
91036001	91 0360	10.5	1	1 PR	OTTO	IV
91035601	91 0356	15.6	1	1 AR	YOHO	NB
91035801	91 0358	9.3	1	1 PR	OTTO	IV
91036101	91 0361	10.5	1	1 PR	OTTO	IV
91036201	91 0362	10.5	1	1 PT	OTTO	IV
91036301	91 0363	10.5	1	1 PR	OTTO	IV
91036302	91 0363	10.5	2	1 AR	LEAN	NB
91036401	91 0364	10.5	1	1 AR	TUZO	UN
91036501	91 0365	10.5	1	5 PR	OTTO	IV
91036502	91 0365	10.5	2	1 AR	LEAN	NB
91036601	91 0366	10.5	1	2 PR	OTTO	IV
91036602	91 0366	10.5	2	3 UN	POLL	UN
91036701	91 0367	10.5	1	1 AR	APPF	PS
91036901	91 0369	10.3	1	1 AR	LEAN	NB
91037001	91 0370	12.5	1	1 AR	SIDN	NB
91037002	91 0370	12.5	2	1 MO	HAPL	EV
91037301	91 0373	9.5	1	1 AR	INAR	UN
91037401	91 0374	9.0	1	1 AR	MOLL	EV
91037201	91 0372	9.5	1	1 AR	LEAN	NB
91037501	91 0375	14.0	1	1 AR	HURD	PS
91037101	91 0371	10.5	1	3 PR	OTTO	IV

RAYMOND_QUARRY

91037302	91 0373	9.6	1	1 AR	LEAN	NB
91037701	91 0377	9.6	1	1 UN	INDE	UN
91037601	91 0376	9.4	1	5 UN	POLL	UN
91037901	91 0379	9.2	1	1 AR	LEAN	NB
91038001	91 0380	10.5	1	1 AR	LEAN	NB
91038301	91 0383	9.5	1	1 AR	SIDN	NB
91038201	91 0382	9.3	1	1 AR	LEAN	NB
91038501	91 0385	10.5	1	1 UN	INTU	UN
91038502	91 0385	10.5	2	2 UN	POLL	UN
91038503	91 0385	10.5	3	1 AR	LEAN	NB
91038701	91 0387	10.5	1	2 PR	OTTO	IV
91038702	91 0387	10.5	1	9 UN	POLL	UN
91038601	91 0386	9.6	1	1 PO	VAUX	ES
91038801	91 0388	10.5	1	1 PR	OTTO	IV
91038901	91 0389	10.5	1	1 PR	OTTO	IV
91038902	91 0389	10.5	2	1 AR	LEAN	NB
91039101	91 0391	12.0	1	1 UN	INDE	UN
91039102	91 0391	12.0	2	1 MO	HAPL	EV
91039001	91 0390	10.5	1	5 PR	OTTO	IV
91038801	91 0388	10.5	1	1 PR	OTTO	IV
91038901	91 0389	10.5	1	1 PR	OTTO	IV
91039201	91 0392	10.4	1	1 AR	LEAN	NB
91039301	91 0393	9.7	1	1 PR	OTTO	IV
91039401	91 0394	11.3	1	1 AR	HURD	PS
91039501	91 0395	10.5	1	1 PO	VAUX	ES
91039901	91 0399	9.3	1	2 AR	ANOM	PS
91040001	91 0400	10.5	1	5 PR	OTTO	IV
91040101	91 0401	10.4	1	9 PO	VAUX	ES
91040102	91 0401	10.4	1	2 PO	HAZE	ES
91040401	91 0404	7.5	1	1 AR	LEAN	NB
91040402	91 0404	7.5	2	2 AR	LEAN	NB
91040501	91 0405	9.6	1	1 AR	SIDN	NB
91040601	91 0406	10.3	1	1 AR	LEAN	NB
91040701	91 0407	9.6	1	1 AR	SIDN	NB
91040801	91 0408	HI	1	1 AR	INAR	UN
91041301	91 0413	HI	1	1 AR	HURD	PS
91041901	91 0419	9.3	1	1 AR	LEAN	NB
91041801	91 0418	16.0	1	1 AR	HURD	PS
91041701	91 0417	10.3	1	1 PR	OTTO	IV
91042001	91 0420	9.3	1	1 AR	HURD	PS
91042101	91 0421	9.3	1	1 AR	LEAN	NB
91042201	91 0422	9.3	1	1 AR	LEAN	NB
91042202	91 0422	9.3	2	1 AR	LEAN	NB
91042203	91 0422	9.3	3	1 CN	MACK	ES
91042301	91 0423	10.5	1	1 PR	OTTO	IV
91042401	91 0424	10.5	1	2 PR	OTTO	IV
91042402	91 0424	10.5	2	1 CN	JELL	PS
91042501	91 0425	11.5	1	1 UN	INDE	UN
91042701	91 0427	10.5	1	1 PR	OTTO	IV
91042702	91 0427	10.5	2	5 UN	POLL	UN
91042801	91 0428	10.5	1	1 CN	JELL	PS

RAYMOND_QUARRY

91043001	91 0430	11.0	1	1 AR	ANOM	PS
91043401	91 0434	9.5	1	1 AR	INAR	UN
91043301	91 0433	11.0	1	1 UN	POLL	UN
91043101	91 0431	10.5	1	1 PR	OTTO	IV
91043201	91 0432	10.5	1	1 UN	INDE	UN
91043501	91 0435	9.3	1	3 PR	OTTO	IV
91043601	91 0436	9.5	1	1 UN	INDE	UN
91043602	91 0436	9.5	2	1 PO	VAUX	ES
91043603	91 0436	9.5	3	2 UN	POLL	UN
91043901	91 0439	9.3	1	1 PR	OTTO	IV
91043801	91 0438	10.9	1	1 AR	APPF	PS
91044001	91 0440	11.0	1	1 UN	POLL	UN
91044101	91 0441	9.3	1	3 PR	OTTO	IV
91043701	91 0437	13.5	1	1 MO	HAPL	EV
91044201	91 0442	9.6	1	1 PR	OTTO	IV
91044401	91 0444	9.5	1	2 PR	OTTO	IV
91044301	91 0443	11.0	1	63 UN	POLL	UN
91044501	91 0445	9.5	1	1 UN	INDE	UN
91044601	91 0446	9.5	1	1 AR	LEAN	NB
91044701	91 0447	9.5	1	8 PR	OTTO	IV
91044901	91 0449	10.5	1	1 AR	SIDN	NB
91045201	91 0452	8.4	1	1 AR	SIDN	NB
91045301	91 0453	8.3	1	1 AR	LEAN	NB
91045302	91 0453	8.3	2	5 UN	POLL	UN
91045101	91 0451	9.5	1	1 AR	LEAP	NB
91045001	91 0450	20+	1	1 AR	SEAM	PS
91045601	91 0456	8.3	1	1 AR	DART	NB
91045701	91 0457	8.2	1	3 AR	LEAN	NB
91045702	91 0457	8.2	2	1 PO	VAUX	ES
91045703	91 0457	8.2	3	2 UN	POLL	UN
91046001	91 0460	8.2	1	1 PO	VAUX	ES
91046002	91 0460	8.22	1	1 AR	LEAN	NB
91046201	91 0462	8.1	1	1 AR	LEAN	NB
91046301	91 0463	LO	1	1 AR	EMER	EV
91046401	91 0464	8.9	1	1 AR	LEAP	NB
91046501	91 0465	8.2	1	1 AR	TUZO	UN
91046601	91 0466	8.4	1	1 AR	LEAN	NB
91046701	91 0467	9.3	1	1 AR	ANOM	PS
91046801	91 0468	8.2	1	1 AR	LEAN	NB
91046802	91 0468	8.2	2	1 EC	CREE	EV
91046901	91 0469	9.3	1	1 AR	LEAN	NB
91046902	91 0469	9.3	2	1 AR	LEAN	NB
91047001	91 0470	8.2	1	1 AR	LEAN	NB
91047002	91 0470	8.2	2	2 AR	LEAN	NB
91047101	91 0471	13.8	1	1 AR	TUZO	UN
91047201	91 0472	8.6	1	4 PR	OTTO	IV
91047202	91 0472	8.6	2	1 AR	PAGE	PS
91047203	91 0472	8.6	3	2 UN	POLL	UN
91047301	91 0473	9.3	1	1 AR	LEAN	NB
91047401	91 0474	9.2	1	2 PR	OTTO	IV
91047402	91 0474	9.2	2	1 AR	LEAN	NB

RAYMOND_QUARRY

91047403	91 0474	9.2	3	1 PO	VAUX	ES
91047501	91 0475	9.3	1	3 PO	TAKA	ES
91047502	91 0475	9.3	2	1 HE	TUBU	ES
91047601	91 0476	9.3	1	5 PR	OTTO	IV
91047701	91 0477	13.9	1	1 AR	INAR	UN
91047801	91 0478	9.5	1	1 AR	LEAN	NB
91047802	91 0478	9.5	2	1 PR	OTTO	IV
91047901	91 0479	9.1	1	1 AR	LEAN	NB
91048101	91 0481	9.0	1	3 PR	OTTO	IV
91048401	91 0484	9.3	1	37 UN	POLL	UN
91048001	91 0480	8.1	1	1 PO	VAUX	ES
91048201	91 0482	8.0	1	1 AR	LEAN	NB
91048501	91 0485	9.3	1	1 AR	LEAN	NB
91048301	91 0483	8.2	1	1 AR	PARK	EV
91048801	91 0488	13.6	1	1 AR	OLEN	EV
91048601	91 0486	8.9	1	3 PR	OTTO	IV
91049001	91 0490	9.3	1	1 PR	OTTO	IV
91048901	91 0489	13.4	1	1 CN	JELL	PS
91048701	91 0487	9.3	1	1 PR	OTTO	IV
91049101	91 0491	9.4	1	1 PR	OTTO	NB
91049301	91 0493	9.3	1	1 AR	LEAN	NB
91049701	91 0497	9.3	1	1 AR	ISOX	PS
91049901	91 0499	9.3	1	1 AR	APPF	PS
91049401	91 0494	9.3	1	1 AR	OLEN	EV
91049402	91 0494	9.3	2	1 MO	HAPL	EV
91049403	91 0494	9.3	3	1 AR	ALUT	PS
91049501	91 0495	8.2	1	1 AR	LEAN	NB
91049601	91 0496	9.3	1	1 AR	LEAN	NB
91050001	91 0500	8.8	1	1 AR	LEAN	NB
91050002	91 0500	8.8	2	2 UN	POLL	UN
91050201	91 0502	8.5	1	1 UN	INDE	UN
91050301	91 0503	8.4	1	1 PR	OTTO	IV
91050101	91 0501	8.3	1	1 AR	LEAN	NB
91050601	91 0506	8.3	1	1 AR	ANOD	PS
91050701	91 0507	8.3	1	1 AR	ANOM	PS
91008301	91 0083	HI	1	1 AR	SIDN	NB
91008501	91 0085	HI	1	1 UN	INDE	UN
91008502	91 0085	HI	2	1 AR	PAGE	PS
91008401	91 0084	9.6	1	6 PR	OTTO	IV
91008601	91 0086	7.6	1	1 PR	OTTO	IV
91008602	91 0086	7.6	2	1 AR	OLEN	EV
91008701	91 0087	10.3	1	1 AR	LEAN	NB
91008702	91 0087	10.3	2	2 PR	OTTO	IV
91008801	91 0088	10.2	1	1 UN	INDE	UN
91011301	91 0113	10.0	1	2 PR	OTTO	IV
91011401	91 0114	10.0	1	1 UN	ICHN	UN
91011101	91 0111	10.0	1	13 UN	POLL	UN
91011201	91 0112	10.0	1	1 UN	INDE	UN
91011501	91 0115	9.9	1	1 PR	OTTO	IV
91011502	91 0115	9.9	2	5 UN	POLL	UN
91010601	91 0106	9.5	1	1 PR	OTTO	IV

RAYMOND_QUARRY

91010701	91 0107	9.7	1	1 PR	OTTO	IV
91010801	91 0108	10.0	1	1 AR	LEAN	NB
91010901	91 0109	9.9	1	2 PR	OTTO	IV
91011001	91 0110	9.9	1	1 AR	TUZO	UN
91010201	91 0102	10.0	1	1 AR	LEAN	NB
91010202	91 0102	10.0	2	1 PR	OTTO	IV
91010401	91 0104	10.6	1	1 PR	OTTO	IV
91010402	91 0104	10.6	2	4 UN	POLL	UN
91010501	91 0105	10.0	1	1 PR	OTTO	IV
91010101	91 0101	9.9	1	1 AR	LEAN	NB
91010301	91 0103	10.0	1	1 PR	OTTO	IV
91009801	91 0098	10.0	1	1 AR	LEAN	NB
91009701	91 0097	10.0	1	1 UN	INWO	UN
91009501	91 0095	9.5	1	1 UN	INDE	UN
91009401	91 0094	9.8	1	1 PR	OTTO	IV
91009601	91 0096	10.0	1	1 PR	OTTO	IV
91010001	91 0100	9.8	1	1 AR	APPF	PS
91009901	91 0099	10.0	1	1 PO	VAUX	ES
91009301	91 0093	9.5	1	1 PR	OTTO	NB
91009201	91 0092	9.9	1	1 AR	LEAN	NB
91008901	91 0089	10.0	1	1 AR	LEAN	NB
91009001	91 0090	HI	1	1 AR	SEAM	PS
91014301	91 0143	9.3	1	1 PR	OTTO	IV
91013501	91 0135	9.8	1	1 AR	LEAN	NB
91013601	91 0136	9.3	1	1 AR	LEAN	NB
91013602	91 0136	9.3	2	1 PR	OTTO	IV
91013401	91 0134	9.2	1	1 AR	LEAP	NB
91013701	91 0137	9.3	1	1 AR	SIDN	NB
91013301	91 0133	9.3	1	1 AR	LEAN	NB
91013201	91 0132	10.0	1	1 PR	OTTO	IV
91013101	91 0131	9.4	1	1 AR	LEAN	NB
91013001	91 0130	10.2	1	1 UN	INDE	UN
91012801	91 0128	9.3	1	1 AR	LEAN	NB
91012901	91 0129	9.7	1	1 AR	LEAN	NB
91012401	91 0124	9.8	1	1 AR	LEAN	NB
91012301	91 0123	9.8	1	1 AR	LEAN	NB
91012701	91 0127	9.8	1	1 AR	INAR	UN
91012501	91 0125	9.8	1	1 PO	CHAN	ES
91012601	91 0126	10.2	1	1 AR	TUZO	UN
91012001	91 0120	10.0	1	1 AR	OLEN	EV
91012101	91 0121	10.0	1	1 UN	POLL	UN
91012201	91 0122	9.8	1	1 AR	HURD	PS
91011901	91 0119	10.0	1	1 PR	OTTO	IV
91011902	91 0119	10.0	2	1 PR	OTTO	IV
91011903	91 0119	10.0	3	1 AR	LEAN	NB
91011904	91 0119	10.0	4	1 AR	LEAN	NB
91011601	91 0116	10.0	1	2 PR	OTTO	IV
91011701	91 0117	10.0	1	1 PR	OTTO	IV
91011801	91 0118	10.0	1	1 PO	VAUX	ES
91014201	91 0142	10.0	1	6 PR	OTTO	IV
91014001	91 0140	10.0	1	1 AR	OLEN	EV

RAYMOND_QUARRY

91013801	91 0138	9.5	1	38 UN	POLL	UN
91014101	91 0141	10.0	1	1 PO	VAUX	ES
91014102	91 0141	10.0	2	1 AR	LEAN	NB
91013901	91 0139	10.0	1	1 PR	OTTO	IV
91014701	91 0147	10.0	1	1 CN	JELL	PS
91014702	91 0147	10.0	2	1 AR	ALUT	PS
91014401	91 0144	9.3	1	4 PR	OTTO	IV
91014401	91 0144	9.3	1	1 PR	OTTO	IV
91014901	91 0149	9.3	1	1 PO	VAUX	ES
91014801	91 0148	10.8	1	1 AR	HABE	NB
91015001	91 0150	HI	1	1 AL	MARG	AA
91015101	91 0151	HI	1	2 AL	MARG	AA
91015201	91 0152	10.2	1	1 AR	HURD	PS
91015301	91 0153	10.0	1	1 AR	APPF	PS
91015401	91 0154	9.2	1	1 AR	LEAN	NB
91015402	91 0154	9.2	2	2 PR	OTTO	IV
91015601	91 0156	9.7	1	1 AR	LEAN	NB
91016001	91 0160	9.1	1	1 AR	ANOM	PS
91016101	91 0161	10.6	1	1 AR	LEAN	NB
91015801	91 0158	8.9	1	1 PO	HAZE	ES
91015802	91 0158	8.9	2	1 PO	VAUX	ES
91015901	91 0159	9.5	1	1 AR	LEAN	NB
91016201	91 0162	9.2	1	1 PO	CHAN	ES
91015701	91 0157	8.9	1	1 AR	SIDN	NB
91016301	91 0163	9.4	1	1 PO	CRUM	ES
91016302	91 0163	9.4	2	1 AR	ANOD	PS
91016303	91 0163	9.4	3	1 PO	VAUX	ES
91016304	91 0163	9.4	4	5 UN	POLL	UN
91016701	91 0167	9.1	1	1 AR	APPF	PS
91016401	91 0164	9.3	1	1 PR	OTTO	IV
91016501	91 0165	9.3	1	1 PR	OTTO	IV
91016601	91 0166	9.3	1	1 PR	OTTO	IV
91016602	91 0166	9.3	2	1 PR	OTTO	IV
91016603	91 0166	9.3	3	1 AR	LEAN	NB
91016801	91 0168	9.1	1	1 AR	LEAP	NB
91017001	91 0170	8.2	1	1 AR	LEAP	NB
91016901	91 0169	9.1	1	1 AR	ANOM	PS
91017301	91 0173	9.8	1	1 AR	LEAN	NB
91017401	91 0174	10.0	1	1 UN	INDE	UN
91017101	91 0171	9.0	1	3 PR	OTTO	IV
91017201	91 0172	9.8	1	1 PR	OTTO	IV
91017701	91 0177	10.0	1	1 AR	LEAN	NB
91017501	91 0175	9.2	1	1 CN	JELL	PS
91017601	91 0176	9.6	1	48 UN	POLL	UN
91017602	91 0176	9.6	2	1 PO	VAUX	ES
91018501	91 0185	9.0	1	2 AR	ANOM	PS
91018001	91 0180	9.6	1	1 PR	OTTO	IV
91018201	91 0182	15.5	1	1 PO	CHOI	ES
91018301	91 0183	10.0	1	1 AR	KOOT	EV
91018401	91 0184	9.6	1	2 AR	OLEN	EV
91018101	91 0181	14.4	1	1 AR	APPF	PS

RAYMOND_QUARRY

91018701	91 0187	10.3	1	1 AR	TUZO	UN
91018801	91 1088	14.6	1	1 AR	LEAP	NB
91018601	91 0186	9.7	1	1 AR	APPF	PS
91019001	91 0190	8.8	1	1 AR	HURD	PS
91018901	91 0189	8.7	1	1 CN	MACK	ES
91018902	91 0189	8.7	2	1 BR	MICR	ES
91018903	91 0189	8.7	3	1 PO	VAUX	ES
91018904	91 0189	8.7	4	1 PO	CHOI	ES
91019301	91 0193	10.0	1	1 AR	INAR	UN
91019101	91 0191	9.1	1	1 AR	ANOM	PS
91019102	91 0191	9.1	2	3 UN	POLL	UN
91019201	91 0192	10.2	1	1 AR	LEAN	NB
91019202	91 0192	10.2	2	1 PR	OTTO	IV
91019401	91 0194	12.0	1	1 PO	CHAN	ES
91019501	91 0195	8.9	1	1 AR	ISOX	PS
91019601	91 0196	9.0	1	1 AR	ANOM	PS
91019701	91 0197	10.2	1	1 PR	OTTO	IV
91019702	91 0197	10.2	2	2 UN	POLL	UN
91019801	91 0198	10.2	1	1 PR	OTTO	IV
91019901	91 0199	10.2	1	1 PR	OTTO	IV
91020001	91 0200	10.3	1	2 PR	OTTO	IV
91020002	91 0200	10.3	2	1 AR	HURD	PS
91020301	91 0203	8.9	1	1 AR	LEAP	NB
91020501	91 0205	8.8	1	1 AR	LEAN	NB
91020101	91 0201	10.1	1	1 AR	SIDN	NB
91020201	91 0202	10.0	1	44 UN	POLL	UN
91020301	91 0203	8.9	1	10 PO	CHAN	ES
91020601	91 0206	10.3	1	1 AR	LEAN	NB
91020602	91 0206	10.3	2	1 PR	OTTO	IV
91020701	91 0207	9.3	1	1 AR	LEAN	NB
91020801	91 0208	9.2	1	1 PR	OTTO	IV
91020802	91 0208	9.2	2	1 PO	VAUX	ES
91020803	91 0208	9.2	3	1 AR	APPF	PS
91021401	91 0214	8.7	1	1 AR	LEAN	NB
91021402	91 0214	8.7	2	1 AR	LEAN	NB
91021501	91 0215	8.6	1	1 PR	OTTO	IV
91021701	91 0217	9.1	1	1 PR	OTTO	IV
91021702	91 0217	9.1	2	1 UN	POLL	UN
91021601	91 0216	10.2	1	1 AR	LEAN	NB
91021602	91 0216	10.2	2	1 PR	OTTO	IV
91021801	91 0218	10.2	1	16 PR	OTTO	IV
91021901	91 0219	8.8	1	1 AR	SIDN	NB
91021902	91 0219	8.8	2	2 PO	VAUX	ES
91022001	91 0220	10.2	1	2 PR	OTTO	IV
91022101	91 0221	10.2	1	3 PR	OTTO	IV
91022201	91 0222	10.4	1	3 PR	OTTO	IV
91022801	91 0228	9.2	1	1 AR	ANOD	PS
91022601	91 0226	15.2	1	1 AR	SIDN	NB
91022701	91 0227	9.3	1	1 PO	CHAN	ES
91022401	91 0224	10.3	1	1 PR	OTTO	IV
91022501	91 0225	10.3	1	1 PR	OTTO	IV

RAYMOND_QUARRY

91022502	91 0225	10.3	2	11 UN	POLL	UN
91023101	91 0231	10.2	1	1 AR	TUZO	UN
91022901	91 0229	8.7	1	2 AR	LEAN	NB
91022902	91 0229	8.7	2	3 PR	OTTO	IV
91022903	91 0229	8.7	3	1 PO	VAUX	ES
91023001	91 0230	10.2	1	1 AR	LEAN	NB
91023002	91 0230	10.2	2	1 AR	NARA	EV
91023003	91 0230	10.2	3	1 PO	CHAN	ES
91023004	91 0230	10.2	4	1 UN	POLL	UN
91023201	91 0232	10.2	1	1 AR	LEAN	NB
91023301	91 0233	15.0	1	1 AR	LEAP	NB
91023801	91 0238	14.5	1	1 AR	INAR	UN
91023401	91 0234	10.2	1	1 PR	OTTO	IV
91023701	91 0237	10.3	1	1 PR	OTTO	IV
91023702	91 0237	10.3	2	1 AR	LEAN	NB
91023703	91 0237	10.3	3	9 UN	POLL	UN
91023501	91 0235	10.2	1	3 PR	OTTO	IV
91023502	91 0235	10.2	2	1 AR	LEAN	NB
91024001	91 0240	14.2	1	4 PR	OTTO	IV
91024101	91 0241	10.3	1	15 PR	OTTO	IV
91024201	91 0242	10.2	1	2 PR	OTTO	IV
91024202	91 0242	10.2	2	3 UN	POLL	UN
91024203	91 0242	10.2	3	1 AR	ORYC	EV
91023901	91 0239	10.2	1	1 PR	OTTO	IV
91024301	91 0243	10.3	1	1 PR	OTTO	IV
91024401	91 0244	10.3	1	2 AR	APPF	PS
91024501	91 0245	9.1	1	3 PR	OTTO	IV
91024502	91 0245	9.1	2	3 BR	MICR	ES
91024503	91 0245	9.1	3	1 PR	OTTO	IV
91024701	91 0247	10.2	1	20 PR	OTTO	IV
91024702	91 0247	10.2	2	1 AR	PAGE	PS
91024703	91 0247	10.2	3	1 AR	TUZO	UN
91024601	91 0246	8.5	1	3 HE	TUBU	ES
91024602	91 0246	8.5	2	1 PO	VAUX	ES
91024801	91 0248	9.5	1	1 PO	VAUX	ES
91024802	91 0248	9.5	2	1 AR	TUZO	UN
91024901	91 0249	10.2	1	2 AR	LEAN	NB
91025101	91 0251	9.6	1	1 UN	INDE	UN
91025102	91 0251	9.6	2	1 AR	ANOM	PS
91025103	91 0251	9.6	3	1 AR	LEAN	NB
91025104	91 0251	9.6	4	11 AR	ALUT	PS
91025201	91 0252	10.7	1	1 AR	APPF	PS
91025401	91 0254	9.6	1	1 PR	OTTO	IV
91025801	91 0258	9.6	1	1 AR	SIDN	NB
91025001	91 0250	9.6	1	1 AR	LEAN	NB
91026001	91 0260	9.8	1	1 AR	INAR	UN
91025701	91 0257	9.8	1	1 UN	INWO	UN
91025601	91 0256	9.3	1	1 AR	HURD	PS
91025901	91 0259	10.2	1	2 PR	OTTO	IV
91025501	91 0255	10.2	1	1 AR	ANOM	PS
91025802	91 0258	10.2	2	1 AR	LEAN	NB

RAYMOND_QUARRY

91026601	91 0266	13.9	1	1 UN	INWO	UN
91026401	91 0264	10.2	1	1 AR	APPF	PS
91026201	91 0262	10.3	1	1 PR	OTTO	IV
91026202	91 0262	10.3	2	1 MO	HAPL	EV
91026501	91 0265	9.3	1	1 AR	LEAN	NB
91026301	91 0263	9.3	1	1 AR	APPF	PS
91026502	91 0265	9.3	2	1 AR	SIDN	NB
91026101	91 0261	9.6	1	1 AR	OLEN	EV
91026701	91 0267	9.3	1	1 AR	LEAN	NB
91026702	91 0267	9.3	2	3 PR	OTTO	IV
91026703	91 0267	9.3	3	1 PR	OTTO	IV
91026801	91 0268	9.3	1	1 AR	LEAN	NB
91027001	91 0270	9.4	1	2 AR	APPF	PS
91027101	91 0271	9.3	1	1 AR	LEAN	NB
91027102	91 0271	9.3	2	1 PO	VAUX	ES
91026901	91 0269	9.3	1	1 AR	LEAN	NB
91026902	91 0269	9.3	2	1 PO	VAUX	ES
91027401	91 0274	9.6	1	1 PO	VAUX	ES
91027402	91 0274	9.6	2	1 AR	INAR	UN
91050702	91 0507	8.3	2	1 PR	OTTO	IV
91050501	91 0505	8.2	1	1 AR	ANOM	PS
91050801	91 0508	9.3	1	2 PR	OTTO	IV
91051001	91 0510	9.3	1	1 PR	OTTO	IV
91051401	91 0514	13.6	1	6 AR	ISOX	PS
91051201	91 0512	9.3	1	1 PR	OTTO	IV
91051301	91 0513	13.7	1	1 AR	APPF	PS
91050901	91 0509	9.3	1	4 PO	CHOI	ES
91051101	91 0511	10.0	1	1 AR	HURD	PS
91051901	91 0519	9.3	1	1 PR	OTTO	IV
91051902	91 0519	9.3	1	13 UN	POLL	UN
91051601	91 0516	8.6	1	1 AR	LEAN	NB
91051501	91 0515	9.3	1	1 AR	LEAN	NB
91051701	91 0517	9.3	1	3 PR	OTTO	IV
91051801	91 0518	9.3	1	1 PR	OTTO	IV
91051601	91 0516	8.6	1	1 AR	LEAN	NB
91052001	91 0520	9.3	1	1 AR	LEAN	NB
91052002	91 0520	9.3	1	1 AR	LEAN	NB
91052401	91 0524	13.4	1	1 AR	HURD	PS
91052402	91 0524	13.4	2	1 VA	SHEL	SH
91052201	91 0522	10.0	1	1 AR	APPF	PS
91052101	91 0521	9.3	1	1 AR	LEAN	NB
91052601	91 0526	9.3	1	1 AR	ISOX	PS
91052602	91 0526	9.3	2	1 AR	LEAN	NB
91052801	91 0528	8.6	1	1 BR	NISU	ES
91052802	91 0528	8.6	2	1 BR	MICR	ES
91052501	91 0525	13.5	1	1 AR	ANOD	PS
91052701	91 0527	9.3	1	1 PR	OTTO	IV
91052702	91 0527	9.3	2	2 AR	ALUT	PS
91053001	91 0530	9.3	1	1 AR	SIDN	NB
91053101	91 0531	8.5	1	1 BR	MICR	ES
91053201	91 0532	9.3	1	1 PR	OTTO	IV

RAYMOND_QUARRY

91053202	91 0532	9.3	2	1 AR	LEAN	NB
91053401	91 0534	8.8	1	1 AR	ANOD	PS
91053402	91 0534	8.8	2	1 PO	VAUX	ES
91053301	91 0533	9.3	1	1 AR	ANOM	PS
91053701	91 0537	8.9	1	1 AR	TUZO	UN
91053501	91 0535	9.3	1	1 AR	LEAN	NB
91053601	91 0536	9.3	1	1 UN	INWO	UN
91053602	91 0536	9.3	2	2 UN	POLL	UN
91054001	91 0540	8.8	1	5 PR	OTTO	IV
91053901	91 0539	9.3	1	1 PO	TAKA	ES
91053801	91 0538	9.3	1	1 PR	OTTO	IV
91054201	91 0542	9.1	1	1 AR	LEAN	NB
91054202	91 0542	9.1	2	19 UN	POLL	UN
91054101	91 0541	8.8	1	1 AR	LEAN	NB
91054102	91 0541	8.8	2	1 AR	INAR	UN
91054301	91 0543	8.8	1	7 AR	LEAN	NB
91054302	91 0543	8.8	2	1 VA	SHEL	SH
91054401	91 0544	9.3	1	2 AR	LEAN	NB
91054501	91 0545	9.3	1	1 AR	ANOM	PS
91054701	91 0547	13.4	1	2 AR	APPF	PS
91054702	91 0547	13.4	2	1 AR	PAGE	PS
91054801	91 0548	8.4	1	2 AR	APPF	PS
91055101	91 0551	8.9	1	1 AR	LEAN	NB
91054901	91 0549	8.9	1	1 AR	HURD	PS
91053301	91 0533	9.3	1	1 AR	LEAN	NB
91055501	91 0555	9.3	1	1 AR	LEAN	NB
91055201	91 0552	8.3	1	1 AR	LEAP	NB
91055701	91 0557	9.6	1	1 AR	TUZO	UN
91055401	91 0554	8.0	1	1 PR	OTTO	IV
91055402	91 0554	8.0	2	2 AR	LEAN	NB
91055601	91 0556	13.2	1	1 AR	EHMA	EV
91055602	91 0556	13.2	2	1 VA	SHEL	SH
91056601	91 0566	8.2	1	1 AR	WAPT	NB
91056701	91 0567	13.7	1	1 AR	APPF	PS
91056301	91 0563	8.0	1	1 AR	LEAN	NB
91056501	91 0565	9.3	1	1 AR	HURD	PS
91056901	91 0569	12.8	1	1 AR	HURD	PS
91055801	91 0558	8.0	1	1 PR	OTTO	IV
91056401	91 0564	9.3	1	1 AR	LEAN	NB
91056801	91 0568	9.0	1	1 PR	OTTO	IV
91056802	91 0568	9.0	2	1 AR	ANOM	PS
91057101	91 0571	14.4	1	1 AR	INAR	UN
91057001	91 0570	13.5	1	1 AR	OLEN	EV
91057002	91 0570	13.5	2	1 AR	EHMA	EV
91057201	91 0572	9.0	1	1 AR	NARA	EV
91057401	91 0574	14.5	1	1 AR	WAPT	NB
91057601	91 0576	9.0	1	1 AR	NECT	PS
91057501	91 0575	14.6	1	1 AR	APPF	PS
91057301	91 0573	14.7	1	1 UN	INDE	UN
91057701	91 0577	9.1	1	1 AR	HURD	PS
91057801	91 0578	9.0	1	1 PO	CHOI	ES

RAYMOND_QUARRY

91057802	91 0578	9.0	2	1 PO	VAUX	ES
91058101	91 0581	7.5	1	1 AR	LEAN	NB
91058001	91 0580	8.6	1	1 AR	SIDN	NB
91057901	91 0579	9.3	1	1 AR	HURD	PS
91058201	91 0582	8.0	1	1 AR	LEAN	NB
91058501	91 0585	HI	1	1 AR	HURD	PS
91058301	91 0583	9.4	1	1 AR	LEAN	NB
91058401	91 0584	9.0	1	3 PR	OTTO	IV
91058402	91 0584	9.0	2	1 AR	LEAN	NB
91058601	91 0586	13.0	1	1 CN	MACK	ES
91058901	91 0589	13.1	1	1 AR	TUZO	UN
91058801	91 0588	HI	1	1 AR	LEAN	NB
91058701	91 0587	13.1	1	1 AR	HURD	PS
91059101	91 0591	10.3	1	1 AR	SEAM	PS
91059001	91 0590	8.0	1	1 AR	SIDN	NB
91062601	91 0626	NL	1	1 AR	HABB	NB
91062701	91 0627	8.3	1	3 AR	LEAN	NB
91062702	91 0627	8.3	2	1 AR	INAR	UN
91062703	91 0627	8.3	3	1 UN	POLL	UN
91062704	91 0627	8.3	4	1 PO	VAUX	ES
91062705	91 0627	8.3	5	4 AR	ALUT	PS
91063001	91 0630	NL	1	1 AR	ISOX	PS
91062901	91 0629	NL	1	1 AR	HABB	NB
91062902	91 0629	NL	2	1 AR	INAR	UN
91062903	91 0629	NL	3	1 PR	SELK	IV
91062801	91 0628	8.4	1	1 AR	LEAN	NB
91062802	91 0628	8.4	2	1 AR	SIDN	NB
91063201	91 0632	NL	1	1 PO	CHAN	ES
91063101	91 0631	8.9	1	2 AR	LEAN	NB
91063102	91 0631	8.9	2	1 PO	VAUX	ES
91063301	91 0633	NL	1	1 PR	OTTO	IV
91063302	91 0633	NL	2	1 PR	OTTO	IV
91063303	91 0633	NL	3	1 AR	WAPT	NB
91063401	91 0634	8.9	1	10 AR	LEAN	NB
91063402	91 0634	8.9	2	1 AR	LEAN	NB
91063501	91 0635	NL	1	1 AR	WAPT	NB
91063801	91 0638	NL	1	1 AR	LEAN	NB
91063701	91 0637	NL	1	1 AR	LEAN	NB
91063702	91 0637	NL	2	1 UN	INDE	UN
91063601	91 0636	8.2	1	1 AR	ANOM	PS
91064001	91 0640	8.4	1	65 PO	CHOI	ES
91064002	91 0640	8.4	2	1 AR	LEAN	NB
91063901	91 0639	NL	1	1 UN	INDE	UN
91064201	91 0642	8.0	1	1 AR	ANOM	PS
91064401	91 0644	12.8	1	1 AR	HURD	PS
91064402	91 0644	12.8	2	1 AR	PAGE	PS
91064403	91 0644	12.8	3	1 VA	SHEL	SH
91064601	91 0646	8.1	1	1 AR	LEAN	NB
91065101	91 0651	8.3	1	1 AR	OLEN	EV
91064701	91 0647	NL	1	1 AR	INAR	UN
91065001	91 0650	8.2	1	1 PR	OTTO	IV

RAYMOND_QUARRY

91065601	91 0656	NL	1	1 AR	LEAN	NB
91065401	91 0654	NL	1	1 PR	OTTO	IV
91065501	91 0655	NL	1	1 AR	LEAN	NB
91064501	91 0645	NL	1	1 AR	WAPT	NB
91064502	91 0645	NL	2	1 UN	POLL	UN
91065301	91 0653	8.0	1	1 PR	OTTO	IV
91066001	91 0660	NL	1	1 CN	MACK	ES
91066002	91 0660	NL	2	1 CN	MACK	ES
91066003	91 0660	NL	3	9 UN	POLL	UN
91065701	91 0657	NL	1	1 AR	APPF	PS
91065702	91 0657	NL	2	2 PO	VAUX	ES
91066401	91 0664	14.2	1	2 AR	LEAN	NB
91066501	91 0665	14.0	1	1 PO	VAUX	ES
91066502	91 0665	14.0	2	1 PO	CHAN	ES
91065801	91 0658	8.4	1	1 AR	NARA	EV
91066201	91 0662	NL	1	1 AR	CANA	NB
91066301	91 0663	13.5	1	1 AR	LEAN	NB
91066601	91 0666	12.5	1	1 PO	HAZE	ES
91066602	91 0666	12.5	2	1 BR	MICR	ES
91067001	91 0670	13.7	1	1 AR	ANOD	PS
91066701	91 0667	13.6	1	1 AR	LEAN	NB
91066801	91 0668	13.5	1	1 AR	HURD	PS
91066901	91 0669	13.7	1	1 AR	INAR	UN
91067101	91 0671	13.5	1	1 CN	MACK	ES
91067102	91 0671	13.5	2	1 BR	MICR	ES
91067501	91 0675	NL	1	1 AR	LEAN	NB
91067502	91 0675	NL	2	2 AR	LEAN	NB
91067601	91 0676	NL	1	1 AR	LEAN	NB
91067301	91 0673	NL	1	1 PR	OTTO	IV
91067302	91 0673	NL	2	2 AR	ALUT	PS
91067303	91 0673	NL	3	1 UN	POLL	UN
91067701	91 0677	9.3	1	1 AR	LEAP	NB
91067201	91 0672	8.0	1	1 AR	LEAN	NB
91068501	91 0685	12.0	1	1 CN	MACK	ES
91068502	91 0685	12.0	2	1 VA	SHEL	SH
91068401	91 0684	11.5	1	1 AR	INAR	UN
91068402	91 0684	11.5	2	2 AR	PAGE	PS
91068201	91 0682	11.5	1	1 AR	APPF	PS
91068301	91 0683	12.6	1	1 AR	APPF	PS
91068101	91 0681	11.5	1	1 AR	HURD	PS
91068701	91 0687	NL	1	1 AR	ANOD	PS
91068801	91 0688	11.3	1	1 AR	HURD	PS
91068802	91 0688	11.3	2	1 VA	SHEL	SH
91068601	91 0686	11.5	1	1 AR	SIDN	NB
91068901	91 0689	11.3	1	1 AR	SIDN	NB
91069301	91 0693	12.0	1	1 AR	ISOX	PS
91069501	91 0695	12.8	1	1 AR	INAR	UN
91069001	91 0690	11.2	1	3 UN	INDE	UN
91069101	91 0691	11.7	1	1 PO	CHOI	ES
91069601	91 0696	11.5	1	1 AR	APPF	PS
91069201	91 0692	11.2	1	1 AR	LEAN	NB

RAYMOND_QUARRY

91069401	91 0694	12.4	1	1 AR	WAPT	NB
91069701	91 0697	12.5	1	1 CN	MACK	ES
91069702	91 0697	12.5	2	1 PO	CHAN	ES
91070001	91 0700	11.4	1	1 AR	WAPT	NB
91069901	91 0699	11.5	1	4 CN	MACK	ES
91069902	91 0699	11.5	2	4 BR	MICR	ES
91069801	91 0698	12.8	1	1 AR	HURD	PS
91070301	91 0703	11.6	1	1 AR	HURD	PS
91070201	91 0702	11.5	1	1 AR	TUZO	UN
91070202	91 0702	11.5	2	2 AR	PAGE	PS
91070601	91 0706	11.6	1	1 AR	APPF	PS
91070501	91 0705	11.5	1	1 AR	HURD	PS
91070502	91 0705	11.5	2	1 AR	PAGE	PS
91070503	91 0705	11.5	3	1 VA	SHEL	SH
91070504	91 0705	11.5	4	1 PO	HAZE	ES
91070401	91 0704	11.5	1	1 AR	LEAN	NB
91070701	91 0707	11.4	1	5 PR	OTTO	IV
91070702	91 0707	11.4	2	1 AR	LEAN	NB
91070801	91 0708	NL	1	1 AR	HURD	PS
91070901	91 0709	11.4	1	1 AR	LEAN	NB
91070902	91 0709	11.4	2	1 PO	VAUX	ES
91071001	91 0710	NL	1	1 AR	SIDN	NB
91071101	91 0711	11.4	1	1 AR	LEAN	NB
91071301	91 0713	11.4	1	1 AR	WAPT	NB
91071201	91 0712	11.5	1	1 AR	HURD	PS
91071401	91 0714	11.4	1	1 AR	SIDN	NB
91071701	91 0717	11.4	1	1 PR	OTTO	IV
91071702	91 0717	11.4	2	1 VA	SHEL	SH
91071601	91 0716	11.4	1	1 AN	POLY	UN
91071501	91 0715	11.4	1	1 AR	SIDN	NB
91071901	91 0719	11.6	1	1 AR	SIDN	NB
91071801	91 0718	11.4	1	1 AR	LEAN	NB
91072001	91 0720	13.0	1	1 AR	LEAN	NB
91072101	91 0721	11.1	1	1 AR	SIDN	NB
91072201	91 0722	13.2	1	1 PO	CHAN	ES
91072301	91 0723	13.2	1	1 PO	CHOI	ES
91072501	91 0725	11.4	1	1 PR	OTTO	IV
91072601	91 0726	11.2	1	1 AR	SIDN	NB
91072401	91 0724	11.1	1	1 AR	HURD	PS
91072701	91 0727	11.2	1	1 AR	SIDN	NB
91072801	91 0728	11.4	1	4 BR	MICR	ES
91072901	91 0729	14.5	1	1 AR	WAPT	NB
91072802	91 0728	11.4	2	1 VA	SHEL	SH
91073001	91 0730	13.1	1	1 PO	VAUX	ES
91073002	91 0730	13.1	2	1 UN	INDE	UN
91073003	91 0730	13.1	3	1 VA	SHEL	SH
91073201	91 0732	12.8	1	1 AR	AGNO	PS
91073701	91 0737	11.0	1	1 AR	INAR	UN
91073501	91 0735	11.0	1	1 AR	LEAP	NB
91073401	91 0734	12.8	1	1 AR	SEAM	PS
91073301	91 0733	12.9	1	1 AR	INAR	UN

RAYMOND_QUARRY

91073601	91 0736	11.5	1	1 AR	LEAN	NB
91073801	91 0738	12.7	1	1 AR	CANA	NB
91074101	91 0741	11.3	1	1 AR	LEAN	NB
91073901	91 0739	12.9	1	1 AR	SEAM	PS
91074001	91 0740	11.5	1	4 BR	MICR	ES
91074002	91 0740	11.5	2	1 AR	INAR	UN
91074201	91 0742	12.5	1	1 UN	INDE	UN
91074202	91 0742	12.5	2	1 AR	PAGE	PS
91074401	91 0744	12.8	1	1 PO	CHAN	ES
91074601	91 0746	12.6	1	2 PR	OTTO	IV
91074501	91 0745	10.5	1	1 AR	TUZO	UN
91074801	91 0748	12.5	1	1 AR	PRIS	ES
91074901	91 0749	12.8	1	1 AR	SKAN	EV
91075201	91 0752	11.4	1	1 PR	OTTO	IV
91075101	91 0751	11.4	1	10 PR	OTTO	IV
91075001	91 0750	10.9	1	1 AR	LEAN	NB
91075401	91 0754	11.5	1	1 AR	LEAN	NB
91075301	91 0753	14.6	1	1 AR	APPF	PS
91075601	91 0756	10.5	1	1 AR	LEAP	NB
91075701	91 0757	13.0	1	1 AR	ANOD	PS
91075501	91 0755	13.3	1	1 AR	SIDN	NB
91075901	91 0759	10.6	1	1 PO	VAUX	ES
91076201	91 0762	12.9	1	1 AR	SIDN	NB
91076001	91 0760	10.6	1	1 PR	OTTO	IV
91076002	91 0760	10.6	2	1 MO	HAPL	EV
91076003	91 0760	10.6	3	1 PR	OTTO	IV
91076101	91 0761	10.7	1	1 AR	LEAP	NB
91076301	91 0763	11.1	1	1 AR	SIDN	NB
91076501	91 0765	11.5	1	1 AR	SIDN	NB
91076401	91 0764	13.9	1	1 AR	ANOM	PS
91076601	91 0766	13.9	1	1 AR	HURD	PS
91076701	91 0767	10.5	1	1 AR	HURD	PS
91076801	91 0768	11.6	1	2 PR	OTTO	IV
91076802	91 0768	11.6	2	1 AR	ISOX	PS
91076901	91 0769	11.3	1	1 MO	HAPL	EV
91077101	91 0771	11.1	1	1 AR	ANOM	PS
91077201	91 0772	11.3	1	2 PR	OTTO	IV
91077001	91 0770	11.5	1	1 AR	LEAN	NB
91077401	91 0774	12.6	1	1 AR	INAR	UN
91077501	91 0775	10.8	1	1 PR	OTTO	IV
91077601	91 0776	13.2	1	1 AR	APPF	PS
91078101	91 0781	11.5	1	1 AR	SIDN	NB
91078001	91 0780	10.5	1	1 AR	LEAN	NB
91077801	91 0778	11.3	1	1 PR	OTTO	IV
91077802	91 0778	11.3	2	1 AR	INAR	UN
91077701	91 0777	11.3	1	1 AR	TUZO	UN
91078201	91 0782	11.4	1	5 PR	OTTO	IV
91078301	91 0783	11.0	1	1 PO	VAUX	ES
91078302	91 0783	11.0	2	1 AR	ANOM	PS
91078401	91 0784	13.9	1	1 AR	HURD	PS
91078402	91 0784	13.9	2	1 VA	SHEL	SH

RAYMOND_QUARRY

91078501	91 0785	11.5	1	1 AR	LEAN	NB
91078502	91 0785	11.5	2	1 PR	OTTO	IV
91078601	91 0786	10.6	1	1 AR	ODAR	PS
91078901	91 0789	11.5	1	1 CN	MACK	ES
91079001	91 0790	11.5	1	1 AR	SIDN	NB
91078801	91 0788	9.9	1	1 AR	LEAN	NB
91078802	91 0788	9.9	2	1 PR	OTTO	IV
91078803	91 0788	9.9	3	1 VA	SHEL	SH
91079101	91 0791	11.8	1	1 AR	LEAN	NB
91079102	91 0791	11.8	2	1 PR	OTTO	IV
91079201	91 0792	11.5	1	1 AR	HURD	PS
91079301	91 0793	10.9	1	6 PR	OTTO	IV
91079401	91 0794	11.3	1	1 AR	LEAN	NB
91079501	91 0795	11.8	1	1 AR	HURD	PS
91079601	91 0796	10.3	1	1 AR	SIDN	NB
91079801	91 0798	11.5	1	2 AR	LEAN	NB
91079802	91 0798	11.5	2	1 AR	LEAN	NB
91079901	91 0799	11.3	1	1 AR	LEAN	NB
91079902	91 0799	11.3	2	1 AR	INAR	UN
91080001	91 0800	11.1	1	2 PR	OTTO	IV
91080002	91 0800	11.1	2	1 AR	LEAN	NB
91080101	91 0801	11.4	1	1 PR	OTTO	IV
91080201	91 0802	10.5	1	1 AR	LEAN	NB
91080301	91 0803	9.5	1	1 AR	APPF	PS
91080401	91 0804	13.8	1	1 UN	INDE	UN
91080501	91 0805	13.7	1	1 AR	AGNO	PS
91080601	91 0806	9.5	1	8 UN	POLL	UN
91080602	91 0806	9.5	2	1 AR	APPF	PS
91080801	91 0808	10.5	1	1 AR	LEAN	NB
91080901	91 0809	11.4	1	1 PR	OTTO	IV
91081201	91 0812	9.6	1	1 AR	LEAN	NB
91081202	91 0812	9.6	2	1 AR	LEAN	NB
91081601	91 0816	10.6	1	1 ON	HALD	EV
91081602	91 0816	10.6	2	1 AR	HELM	EV
91081401	91 0814	9.4	1	1 AR	ANOM	PS
91081301	91 0813	10.2	1	1 AR	LEAN	NB
91081501	91 0815	9.6	1	1 AR	LEAN	NB
91081701	91 0817	10.5	1	2 PR	OTTO	IV
91081801	91 0818	9.6	1	1 AR	LEAN	NB
91081901	91 0819	9.2	1	1 PO	VAUX	ES
91081902	91 0819	9.2	2	1 UN	INWO	UN
91082001	91 0820	9.3	1	1 PO	VAUX	ES
91082101	91 0821	10.4	1	1 AR	NARA	EV
91082201	91 0822	10.5	1	1 AR	LEAN	NB
91082301	91 0823	10.9	1	1 AR	APPF	PS
91082401	91 0824	11.4	1	3 PR	OTTO	IV
91082501	91 0825	9.6	1	1 AR	LEAN	NB
91082502	91 0825	9.6	2	1 AR	LEAN	NB
91082601	91 0826	9.6	1	1 AR	LEAN	NB
91082602	91 0826	9.6	2	1 AR	LEAN	NB
91082603	91 0826	9.6	3	1 HE	TUBU	ES

RAYMOND_QUARRY

91082701	91 0827	13.7	1	1 AR	SIDN	NB
91082801	91 0828	10.1	1	1 BR	MICR	ES
91082901	91 -829	10.3	1	1 AR	ISOX	PS
91083001	91 0830	11.0	1	1 AR	INAR	UN
91083101	91 0831	10.8	1	1 AR	LEAN	NB
91083201	91 0832	10.8	1	13 UN	POLL	UN
91083401	91 0834	NL	1	1 AR	TUZO	UN
91083402	91 0834	NL	2	1 AR	ALUT	PS
91083601	91 0836	11.0	1	1 AR	SIDN	NB
91083701	91 0837	9.8	1	1 AR	HURD	PS
91083702	91 0837	9.8	2	1 AR	LEAN	NB
91084001	91 0840	11.0	1	1 AR	LEAN	NB
91083801	91 0838	11.1	1	1 PO	VAUX	ES
91083901	91 0839	9.8	1	1 AR	LEAN	NB
91084101	91 0841	11.3	1	3 PR	OTTO	IV
91084201	91 0842	9.7	1	4 PR	OTTO	IV
91084202	91 0842	9.7	2	1 AR	LEAN	NB
91084203	91 0842	9.7	3	1 AR	INAR	UN
91084301	91 0843	9.6	1	1 AR	LEAP	NB
91084501	91 0845	11.4	1	1 AR	SIDN	NB
91084401	91 0844	11.0	1	1 AR	TUZO	UN
91084701	91 0847	13.7	1	1 AL	MARG	AA
91084601	91 0846	9.4	1	1 AR	ANOM	PS
91084601	91 0846	9.4	1	1 AR	ANOM	PS
91084801	91 0848	13.8	1	1 AR	HURD	PS
91084901	91 0849	11.0	1	1 AR	HURD	PS
91085001	91 0850	11.4	1	1 PR	OTTO	IV
91085002	91 0850	11.4	2	1 AR	ANOD	PS
91085101	91 0851	10.5	1	1 AR	ANOM	PS
91085102	91 0851	10.5	2	1 UN	POLL	UN
91085201	91 0852	10.2	1	24 PR	OTTO	IV
91085202	91 0852	10.2	2	1 AR	PAGE	PS
91085301	91 0853	13.8	1	1 AR	HURD	PS
91085401	91 0854	9.7	1	1 AR	SIDN	NB
91085402	91 0854	9.7	2	1 PR	OTTO	IV
91085501	91 0855	10.9	1	1 AR	SEAM	PS
91085601	91 0856	10.3	1	1 AR	SIDN	NB
91085701	91 0857	10.3	1	1 PR	OTTO	IV
91085801	91 0858	13.6	1	1 AR	ANOD	PS
91085802	91 0858	13.6	2	1 AR	PAGE	PS
91086001	91 0860	10.4	1	1 PR	OTTO	IV
91086002	91 0860	10.4	2	1 AR	TUZO	UN
91086101	91 0861	10.5	1	1 AR	LEAN	NB
91086201	91 0862	13.4	1	1 CN	JELL	PS
91086202	91 0862	13.4	2	4 MO	HAPL	EV
91086301	91 0863	11.0	1	1 AR	SIDN	NB
91086401	91 0864	10.1	1	1 CN	JELL	PS
91087001	91 0870	10.3	1	61 UN	POLL	UN
91087002	91 0870	10.3	2	2 AR	LEAN	NB
91086501	91 0865	10.9	1	1 AR	ANOD	PS
91086601	91 0866	9.7	1	1 AR	NARA	EV

RAYMOND_QUARRY

91041201	91 0412	8.9	1	1 AR	HURD	PS
91041202	91 0412	8.9	2	1 AR	ANOM	PS
91041203	91 0412	8.9	3	4 BR	MICR	ES
91045401	91 0454	8.3	1	1 AR	LEAN	NB
91045402	91 0454	8.3	2	1 AR	LEAP	NB
91045403	91 0454	8.3	3	1 UN	POLL	UN
91017901	91 0179	9.4	1	3 PR	OTTO	IV
91045801	91 0458	8.2	1	2 PO	VAUX	ES
91045802	91 0458	8.2	2	1 AR	SIDN	NB
91045803	91 0458	8.2	3	1 BR	MICR	ES
91045901	91 0459	8.0	1	1 UN	INDE	UN
91045902	91 0459	8.0	2	1 AR	LEAN	NB
91052301	91 0523	9.3	1	2 AR	LEAN	NB
91052302	91 0523	9.3	2	1 PR	OTTO	IV
91067801	91 0678	NL	1	1 UN	INDE	UN
91067802	91 0678	NL	2	13 MO	HAPL	EV
91067803	91 0678	NL	3	1 AR	PAGE	PS
91067901	91 0679	8.9	1	30 PO	VAUX	ES
91067902	91 0679	8.9	2	15 UN	POLL	UN
91067903	91 0679	8.9	3	1 PR	OTTO	IV
91070101	91 0701	11.2	1	1 CN	JELL	PS
91073101	91 0731	12.1	1	1 BR	MICR	ES
91073102	91 0731	12.1	2	6 BR	MICR	ES
91073103	91 0731	12.1	3	17 PO	CHAN	ES
91095001	91 0950	10.2	1	1 AR	SIDN	NB
91095002	91 0950	10.2	2	2 AR	LEAN	NB
91095003	91 0950	10.2	3	1 VA	SHEL	SH
91074301	91 0743	9.1	1	17 PO	VAUX	ES
91074302	91 0743	9.1	2	1 AR	APPF	PS
91074303	91 0743	9.1	3	4 PR	OTTO	IV
91074304	91 0743	9.1	4	1 AR	HURD	PS
91074305	91 0743	9.1	5	2 UN	POLL	UN
91097201	91 0972	10.3	1	2 AR	ANOM	PS
91097202	91 0972	10.3	2	35 PR	OTTO	IV
91101401	91 1014	10.0	1	1 CN	JELL	PS
91101402	91 1014	10.0	2	10 MO	HAPL	EV
91101403	91 1014	10.0	3	1 PO	HAZE	ES
91101404	91 1014	10.0	4	7 PR	OTTO	IV
91101405	91 1014	10.0	5	1 AR	SIDN	NB
91101406	91 1014	10.0	6	1 AR	OLEN	EV
91101601	91 1016	9.8	1	1 CN	JELL	PS
91101602	91 1016	9.8	2	2 PR	OTTO	IV
91101701	91 1017	9.8	1	2 CN	JELL	PS
91101702	91 1017	9.8	2	3 PR	OTTO	IV
91105701	91 1057	9.3	1	1 AR	SIDN	NB
91105702	91 1057	9.3	2	1 AR	SIDN	NB
91106001	91 1060	9.9	1	16 MO	HELC	EV
91106001	91 1060	9.9	2	1 VA	SHEL	SH
91115101	91 1151	9.3	1	1 AR	LEAN	NB
91115102	91 1151	9.3	2	1 AR	HURD	PS
91115201	91 1152	9.1	1	1 AR	LEAN	NB

RAYMOND_QUARRY

91115202	91 1152	9.1	2	1 AR	LEAN	NB
91115203	91 1152	9.1	3	1 AR	HURD	PS
91115301	91 1153	9.3	1	1 AR	SIDN	NB
91115302	91 1153	9.3	2	1 AR	SIDN	NB
91137101	91 1371	9.2	1	2 AR	LEAN	NB
91137102	91 1371	9.2	2	1 AR	LEAN	NB
91137103	91 1371	9.2	3	1 AR	SIDN	NB
91137104	91 1371	9.2	4	1 PR	OTTO	IV
91137105	91 1371	9.2	5	1 AR	ANOD	PS
91137201	91 1372	9.4	1	2 AR	SIDN	NB
91137202	91 1372	9.4	2	14 PO	VAUX	ES
91137301	91 1373	8.8	1	1 CN	JELL	PS
91137302	91 1373	8.8	2	1 MO	HAPL	EV
91137303	91 1373	8.8	3	3 PR	OTTO	IV
91137401	91 1374	NL	1	53 UN	POLL	UN
91137402	91 1374	NL	2	1 AR	ANOM	PS
91137403	91 1374	NL	3	1 AR	HURD	PS
91137404	91 1374	NL	4	1 AR	WAPT	NB
91137405	91 1374	NL	5	1 AR	TUZO	UN
91137406	91 1374	NL	6	10 PR	OTTO	IV
91137407	91 1374	NL	7	8 PO	VAUX	ES
91137501	91 1375	8.9	1	1 AR	SIDN	NB
91137502	91 1375	8.9	2	1 AR	SIDN	NB
91137503	91 1375	8.9	3	11 PO	VAUX	ES
91137504	91 1375	8.9	4	1 EC	CREE	EV
91137505	91 1375	8.9	5	1 AR	ISOX	PS
91137601	91 1376	9.4	1	1 AR	SIDN	NB
91137602	91 1376	9.4	2	1 AR	SIDN	NB
91137603	91 1376	9.4	3	1 AR	SIDN	NB
91137604	91 1376	9.4	4	3 PO	VAUX	ES
91141001	91 1410	9.5	1	3 AR	SIDN	NB
91141002	91 1410	9.5	2	3 PO	VAUX	ES
91141003	91 1410	9.5	3	30 AR	PRIS	ES
91141101	91 1411	9.8	1	1 AR	SIDN	NB
91141102	91 1411	9.8	2	1 AR	HURD	PS
91141103	91 1411	9.8	3	1 PO	VAUX	ES
91141201	91 1412	10.4	1	2 CN	JELL	PS
91141202	91 1412	10.4	2	5 PR	OTTO	IV
91141301	91 1413	11.1	1	1 CN	JELL	PS
91141302	91 1413	11.1	2	1 PR	OTTO	IV
91141401	91 1414	9.4	1	1 AR	SIDN	NB
91149001	91 1490	9.8	1	1 CN	JELL	PS
91150501	91 1505	8.9	1	7 PO	CHAN	ES
91150502	91 1505	8.9	2	2 PO	VAUX	ES
91150503	91 1505	8.9	3	5 BR	MICR	ES
91150601	91 1506	10.5	1	4 AR	SIDN	NB
91150602	91 1506	10.5	2	1 AR	TUZO	UN
91150603	91 1506	10.5	3	1 AR	INAR	UN
91150604	91 1506	10.5	4	1 AR	ALUT	PS
91150605	91 1506	10.5	5	54 PR	OTTO	IV
91150701	91 1507	9.3	1	12 PR	OTTO	IV

RAYMOND_QUARRY

91150801	91 1508	9.1	1	3 AR	SIDN	NB
91150802	91 1508	9.1	2	6 AR	SIDN	NB
91150803	91 1508	9.1	3	126 PO	CHOI	ES
91150804	91 1508	9.1	4	3 PO	VAUX	ES
91150805	91 1508	9.1	5	1 BR	NISU	ES
91150806	91 1508	9.1	6	6 BR	MICR	ES
91087101	91 0871	10.3	1	1 PO	VAUX	ES
91087201	91 0872	9.6	1	1 AR	LEAN	NB
91087202	91 0872	9.6	2	1 AR	LEAN	NB
91087203	91 0872	9.6	3	1 AR	LEAN	NB
91087301	91 0873	10.9	1	1 AR	LEAN	NB
91087401	91 0874	8.9	1	1 AR	APPF	PS
91087402	91 0874	8.9	2	1 BR	MICR	ES
91087501	91 0875	10.2	1	12 PR	OTTO	IV
91087601	91 0876	8.8	1	1 AR	CHAP	EV
91087701	91 0877	10.7	1	1 AR	TUZO	UN
91087702	91 0877	10.7	2	1 UN	INDE	UN
81087801	91 0878	10.3	1	3 PR	OTTO	IV
91087702	91 0877	10.3	2	1 AR	LEAN	NB
91087803	91 0878	10.3	3	1 UN	POLL	UN
91087901	91 0879	10.3	1	25 UN	POLL	UN
91087902	91 0879	10.3	2	1 AR	LEAN	NB
91088001	91 0880	10.2	1	1 PR	OTTO	IV
91088002	91 0880	10.2	2	1 AR	LEAN	NB
91088003	91 0880	10.2	3	1 UN	INDE	UN
91088101	91 0881	8.9	1	1 CN	MACK	ES
91088201	91 0882	10.7	1	1 AR	LEAP	NB
91088301	91 0883	10.7	1	1 AR	TUZO	UN
91088401	91 0884	10.4	1	15 PR	OTTO	IV
91088501	91 0885	10.8	1	1 PR	OTTO	IV
91088502	91 0885	10.8	2	1 AR	LEAN	NB
91088601	91 0886	10.8	1	1 AR	APPF	PS
91088701	91 0887	10.5	1	1 AR	LEAN	NB
91088801	91 0888	10.0	1	1 AR	NARA	EV
91088901	91 0889	10.9	1	2 UN	INDE	UN
91088902	91 0889	10.9	2	1 PO	VAUX	ES
91089001	91 0890	10.5	1	1 AR	ANOM	PS
91089101	91 0891	9.3	1	1 AR	SIDN	NB
91089201	91 0892	10.5	1	1 AR	NECT	PS
91089301	91 0893	10.8	1	1 PR	OTTO	IV
91089302	91 0893	10.8	2	1 VA	SHEL	SH
91089401	91 0894	10.6	1	1 AR	LEAP	NB
91089501	91 0895	10.4	1	1 AR	LEAP	NB
91089601	91 0896	8.9	1	1 AR	SIDN	NB
91089701	91 0897	9.8	1	1 AR	ANOD	PS
91089901	91 0899	10.7	1	1 AR	LEAN	NB
91090001	91 0900	10.2	1	1 AR	LEAP	NB
91090101	91 0901	9.0	1	1 AR	SIDN	NB
91090201	91 0902	8.9	1	1 AR	SIDN	NB
91090301	91 0903	10.9	1	1 AR	SEAM	PS
91090401	91 0904	9.6	1	1 PO	VAUX	ES

RAYMOND_QUARRY

91090501	91 0905	10.6	1	1 AR	LEAN	NB
91090601	91 0906	10.0	1	1 AR	LEAP	NB
91090602	91 0906	10.0	2	1 UN	POLL	UN
91090701	91 0907	10.8	1	1 AR	WAPT	NB
91090702	91 0907	10.8	2	1 AR	LEAN	NB
91090801	91 0908	10.5	1	1 AR	LEAP	NB
91090901	91 0909	9.6	1	1 AR	APPF	PS
91091001	91 0910	9.6	1	1 AR	LEAN	NB
91091101	91 0911	10.4	1	1 CN	JELL	PS
91091102	91 0911	10.4	2	1 UN	POLL	UN
91091201	91 0912	9.0	1	1 AR	SIDN	NB
91091301	91 0913	9.6	1	1 AR	LEAN	NB
91091401	91 0914	10.6	1	1 AR	SIDN	NB
91091501	91 0915	9.8	1	1 AR	HURD	PS
91091701	91 0917	13.8	1	1 UN	INDE	UN
91091801	91 0918	10.3	1	1 AR	ISOX	PS
91092001	91 0920	10.3	1	1 AR	ISOX	PS
91092101	91 0921	NL	1	1 PR	OTTO	IV
91092201	91 0922	10.7	1	1 AR	WAPT	NB
91092301	91 0923	9.0	1	1 AR	SIDN	NB
91092501	91 0925	8.8	1	1 PR	OTTO	IV
91092502	91 0925	8.8	2	1 PR	OTTO	IV
91092503	91 0925	8.8	3	1 AR	LEAN	NB
91092601	91 0926	9.6	1	1 AR	SIDN	NB
91092701	91 0927	10.6	1	2 AR	LEAN	NB
91092801	91 0928	9.6	1	1 AR	SIDN	NB
91092901	91 0929	10.6	1	1 AR	LEAN	NB
91093001	91 0930	9.0	1	1 PO	HAZE	ES
91093002	91 0930	9.0	2	1 AR	LEAN	NB
91093003	91 0930	9.0	3	2 BR	MICR	ES
91093004	91 0930	9.0	4	1 AR	ALUT	PS
91093101	91 0931	9.9	1	1 AR	ANOD	PS
91093201	91 0932	9.9	1	1 CT	CTEN	PS
91093301	91 0933	9.4	1	1 AR	LEAN	NB
91093401	91 0934	9.9	1	1 AR	LEAN	NB
91093501	91 0935	9.8	1	1 AR	LEAN	NB
91093601	91 0936	10.5	1	1 AR	LEAN	NB
91093602	91 0936	10.5	2	1 MO	HAPL	EV
91093603	91 0936	10.5	3	1 MO	HELC	EV
91093701	91 0937	10.2	1	2 AR	APPF	PS
91093801	91 0938	9.9	1	1 AR	ANOD	PS
91094001	91 0940	10.5	1	1 AR	LEAN	NB
91093901	91 0939	10.7	1	1 UN	INDE	UN
91094301	91 0943	10.6	1	1 AR	LEAN	NB
91094201	91 0942	9.8	1	1 AR	SIDN	NB
91094601	91 0946	10.3	1	1 AR	LEAN	NB
91094501	91 0945	10.0	1	1 AR	SIDN	NB
91094502	91 0945	10.0	2	1 AR	SIDN	NB
91094503	91 0945	10.0	3	1 PO	VAUX	ES
91094504	91 0945	10.0	4	1 AR	LEAN	NB
91094701	91 0947	10.1	1	1 AR	LEAN	NB

RAYMOND_QUARRY

91094801	91 0948	11.4	1	1 AR	LEAN	NB
91094802	91 0948	11.4	2	1 VA	SHEL	SH
91094901	91 0949	10.5	1	1 AR	SIDN	NB
91095101	91 0951	9.8	1	1 AR	CARN	UN
91095201	91 0952	10.4	1	1 AR	LEAN	NB
91095301	91 0953	10.2	1	1 AR	LEAN	NB
91095302	91 0953	10.2	2	1 UN	INDE	UN
91095401	91 0954	10.0	1	1 AR	LEAN	NB
91095501	91 0955	10.2	1	1 PR	OTTO	IV
91095601	91 0956		1	4 PR	OTTO	IV
91095602	91 0956	9.8	2	1 AR	LEAN	NB
91095603	91 0956	9.8	3	2 UN	POLL	UN
91095701	91 0957	9.8	1	5 UN	POLL	UN
91095801	91 0958	10.4	1	1 PR	OTTO	IV
91095901	91 0959	9.4	1	49 PO	CHOI	ES
91096001	91 0960	10.5	1	1 AR	HURD	PS
91096201	91 0962	9.8	1	1 AR	OPAB	PS
91096101	91 0961	8.6	1	1 AR	LEAN	NB
91096301	91 0963	10.6	1	1 AR	LEAN	NB
91096302	91 0963	10.6	2	1 PR	OTTO	IV
91096401	91 0964	9.8	1	1 PR	OTTO	IV
91096402	91 0964	9.8	2	2 AR	ALUT	PS
91096501	91 0965	9.8	1	1 AR	LEAN	NB
91096601	91 0966	9.8	1	2 AR	LEAN	NB
91096701	91 0967	9.8	1	1 CN	JELL	PS
91096702	91 0967	9.8	2	1 PR	OTTO	IV
91096801	91 0968	8.6	1	1 AR	TUZO	UN
91096901	91 0969	9.0	1	1 AR	LEAN	NB
91097001	91 0970	10.8	1	1 UN	INWO	UN
91097101	91 0971	9.8	1	1 PR	OTTO	IV
91097201	91 0972	10.9	1	1 AR	LEAN	NB
91097401	91 0974	9.4	1	1 UN	INDE	UN
91097501	91 0975	10.7	1	1 AR	LEAN	NB
91097301	91 0973	8.6	1	1 AR	ANOD	PS
91097801	91 0978	10.6	1	2 PR	OTTO	IV
91097701	91 0977	10.8	1	1 AR	LEAP	NB
91098001	91 0980	10.2	1	1 AR	LEAN	NB
91097901	91 0979	10.4	1	1 AR	SIDN	NB
91097902	91 0979	10.4	2	1 PO	VAUX	ES
91097903	91 0979	10.4	3	1 AR	ODAR	PS
91098101	91 0981	11.6	1	1 AR	WAPT	NB
91098201	91 0982	11.0	1	1 AR	LEAN	NB
91098301	91 0983	10.5	1	1 AN	BYRO	ES
91098501	91 0985	10.5	1	1 HE	LEAN	NB
91098601	91 0986	11.5	1	1 CN	MACK	ES
91098401	91 0984	10.2	1	13 PR	OTTO	IV
91098701	91 0987	10.7	1	1 AR	APPF	PS
91098801	91 0988	10.5	1	1 AR	LEAN	NB
91098901	91 0989	9.0	1	1 AR	ANOM	PS
91099001	91 0990	10.3	1	1 AR	APPF	PS
91099101	91 0991	9.0	1	13 UN	POLL	UN

RAYMOND_QUARRY

91099102	91 0991	9.0	2	1 AR	EMER	EV
91099201	91 0992	9.4	1	2 AR	SIDN	NB
91099301	91 0993	9.7	1	1 AR	APPF	PS
91099401	91 994	9.8	1	1 AR	LEAN	NB
91099501	91 0994	9.8	1	1 UN	INDE	UN
91099601	91 0996	10.1	1	12 UN	POLL	UN
91099701	91 0997	10.2	1	1 AR	APPF	PS
91099702	91 0997	10.2	2	1 PO	VAUX	ES
91099801	91 0998	8.6	1	1 PR	LOUI	IV
91099901	91 0999	10.3	1	1 PR	OTTO	IV
91100001	91 1000	9.3	1	1 AR	INAR	UN
91100002	91 1000	9.3	2	1 UN	POLL	UN
91100101	91 1001	9.4	1	2 PR	OTTO	IV
91100201	91 1002	10.2	1	1 PO	TAKA	ES
91100301	91 1003	9.9	1	1 AR	ORYC	EV
91100401	91 1004	10.6	1	1 PO	VAUX	ES
91100501	91 1005	11.0	1	1 AR	HURD	PS
91100601	91 1006	10.6	1	1 AR	WAPT	NB
91100701	91 1007	10.3	1	2 PR	OTTO	IV
91100801	91 1008	10.5	1	1 AR	LEAN	NB
91100901	91 1009	10.6	1	1 AR	LEAN	NB
91100902	91 1009	10.6	2	1 PO	VAUX	ES
91101001	91 1010	10.7	1	1 AR	LEAN	NB
91101101	91 1011	10.5	1	1 AR	LEAP	NB
91101201	91 1012	10.5	1	1 PR	OTTO	IV
91101301	91 1013	10.2	1	1 AR	SIDN	NB
91101401	91 1014		1	2 PR	OTTO	IV
91101901	91 1019	10.0	1	1 CN	MACK	ES
91101801	91 1018	10.6	1	1 AR	SIDN	NB
91102001	91 1020	9.9	1	1 PR	OTTO	IV
91102002	91 1020	9.9	2	1 PR	OTTO	IV
91102003	91 1020	9.9	3	1 AR	LEAN	NB
91102101	91 1021	9.0	1	2 AR	LEAN	NB
91102201	91 1022	10.6	1	7 PR	OTTO	IV
91102301	91 1023	11.2	1	1 AR	HURD	PS
91102302	91 1023	11.2	2	1 VA	SHEL	SH
91102401	91 1024	8.6	1	1 EC	CREE	EV
91102501	91 1025	11.5	1	1 AR	APPF	PS
91102601	91 1026	10.6	1	2 AR	ANOM	PS
91102602	91 1026	10.6	2	1 PR	OTTO	IV
91102603	91 1026	10.6	3	1 AR	PAGE	PS
91102701	91 1027	11.0	1	1 AR	ANOD	PS
91102702	91 1027	11.0	2	1 VA	SHEL	SH
91102801	91 1028	9.0	1	1 AR	APPF	PS
91102802	91 1028	9.0	2	5 UN	POLL	UN
91102803	91 1028	9.0	3	1 PO	VAUX	ES
91102901	91 1029	10.4	1	1 PR	OTTO	IV
91102902	91 1029	10.4	2	2 PR	OTTO	IV
91103001	91 1030	9.4	1	1 AR	LEAP	NB
91103101	91 1031	10.2	1	1 AR	LEAN	NB
91103102	91 1031	10.2	2	1 AR	ALUT	PS

RAYMOND_QUARRY

91103201	91 1032	9.7	1	2 AR	ANOM	PS
91103301	91 1033	10.6	1	1 AR	LEAN	NB
91103302	91 1033	10.6	2	1 CN	JELL	PS
91103401	91 1034	11.5	1	1 AR	ANOM	PS
91103601	91 1036	11.5	1	1 AR	ANOM	PS
91103501	91 1035	8.8	1	1 AR	APPF	PS
91103701	91 1037	11.6	1	1 AR	KOOT	EV
91103702	91 1037	11.6	2	1 AR	HURD	PS
91103703	91 1037	11.6	3	1 VA	SHEL	SH
91103801	91 1038	11.5	1	1 AR	APPF	PS
91103802	91 1038	11.5	2	1 AR	PAGE	EV
91103901	91 1039	8.8	1	1 AR	LEAN	NB
91103902	91 1039	8.8	2	2 PR	OTTO	IV
91104001	91 1040	10.0	1	1 AR	OPAB	PS
91104201	91 1042	9.4	1	1 AR	WAPT	NB
91104301	91 1043	10.0	1	3 PR	OTTO	IV
91104302	91 1043	10.0	2	1 AR	LEAN	NB
91104401	91 1044	9.6	1	1 AR	ANOM	PS
91104601	91 1046	10.6	1	3 PR	OTTO	IV
91104602	91 1046	10.6	2	2 AR	LEAN	NB
91104701	91 1047	10.7	1	1 AR	LEAN	NB
91104801	91 1048	10.5	1	1 PR	OTTO	IV
91104901	91 1049	10.0	1	2 PR	OTTO	IV
91105001	91 1050	8.9	1	1 AR	ISOX	PS
91105101	91 1051	9.5	1	1 AR	LEAP	NB
91105201	91 1052	9.0	1	16 PO	CHOI	ES
91105202	91 1052	9.0	2	1 AR	OLEN	EV
91105301	91 1053		1	2 AR	ANOM	PS
91105601	91 1056	NL	1	1 AR	LEAN	NB
91105401	91 1054	10.9	1	1 AR	LEAN	NB
91105402	91 1054	10.9	2	3 UN	POLL	UN
91105501	91 1055	10.4	1	1 AR	LEAN	NB
91105502	91 1055	10.4	2	17 UN	POLL	UN
91105901	91 1059		1	1 PR	OTTO	IV
91105902	91 1059	NL	2	1 EC	CREE	EV
91106101	91 1061	NL	1	5 PR	OTTO	IV
91106102	91 1061	9.6	2	5 UN	POLL	UN
91106201	91 1062	9.5	1	1 AR	LEAN	NB
91106202	91 1062	9.5	2	1 AR	ALUT	PS
91106301	91 1063	10.5	1	1 AR	LEAN	NB
91106401	91 1064	11.0	1	4 PR	OTTO	IV
91106402	91 1064	11.0	2	2 AR	LEAN	NB
91106501	91 1065	9.5	1	1 AR	LEAN	NB
91106601	91 1066	11.5	1	1 CN	JELL	PS
91106602	91 1066	11.5	2	1 VA	SHEL	SH
91106701	91 1067	9.5	1	1 AR	APPF	PS
91106801	91 1068	10.5	1	1 AR	LEAN	NB
91106802	91 1068	10.5	2	1 UN	INDE	UN
91106901	91 1069	11.0	1	1 AR	INAR	UN
91106902	91 1069	11.0	2	1 AN	TUBU	ES
91107001	91 1070	9.6	1	1 HE	APPF	PA

RAYMOND_QUARRY

91107101	91 1071		1	2 PR	OTTO	IV
91107201	91 1072	NL	1	1 PR	OTTO	IV
91107301	91 1073	NL	1	1 AR	LEAN	NB
91107301	91 1073	9.6	2	1 PO	VAUX	ES
91107401	91 1074		1	1 PR	OTTO	IV
91107501	91 1075	NL	1	1 AR	LEAN	NB
91107601	91 1076	NL	1	1 AR	NECT	PS
91107701	91 1077	11.3	1	10 PR	OTTO	IV
91107901	91 1079	9.0	1	1 AR	LEAN	NB
91107902	91 1079	9.0	2	1 AR	ANOM	PS
91107903	91 1079	9.0	3	30 UN	POLL	UN
91108001	91 1080	11.3	1	1 AR	TUZO	UN
91108101	91 1081	9.5	1	1 AR	LEAN	NB
91108201	91 1082	9.5	1	1 AR	SIDN	NB
91108301	91 1083	9.8	1	2 AR	ANOM	PS
91108401	91 1084	9.8	1	1 AR	HURD	PS
91108402	91 1084	9.8	2	1 PO	HAMP	ES
91108501	91 1085	11.3	1	1 PO	VAUX	ES
91108601	91 1086	10.3	1	2 AR	LEAN	NB
91108602	91 1086	10.3	2	1 AR	LEAN	NB
91108603	91 1086	10.3	3	1 PO	VAUX	ES
91108801	91 1088	9.4	1	2 AR	LEAN	NB
91108701	91 1087	9.5	1	1 AR	HURD	PS
91109101	91 1091	9.6	1	2 PR	OTTO	IV
91109001	91 1090	9.6	1	1 PR	OTTO	IV
91108901	91 1089	10.5	1	1 PO	VAUX	ES
91109201	91 1092	9.6	1	1 PR	OTTO	IV
91109301	91 1093	9.9	1	1 PR	OTTO	IV
91109401	91 1094	10.5	1	1 AR	APPF	PS
91109501	91 1095	9.4	1	1 AR	LEAN	NB
91109502	91 1095	9.4	2	1 PR	OTTO	IV
91109701	91 1097	10.5	1	1 AR	TUZO	UN
91109801	91 1098	10.5	1	1 AR	LEAN	NB
91109802	91 1098	10.5	2	1 UN	POLL	UN
91109601	91 1096	9.6	1	2 PR	OTTO	IV
91109901	91 1099	10.5	1	2 AR	LEAN	NB
91110001	91 1100	9.7	1	1 PO	HAZE	ES
91110101	91 1101	9.7	1	1 PO	CHOI	ES
91110201	91 1102	8.3	1	1 AR	LEAN	NB
91110301	91 1103	9.7	1	1 PO	CHOI	ES
91110302	91 1103	9.7	2	1 PO	VAUX	ES
91110303	91 1103	9.7	3	1 AN	TUBU	ES
91110401	91 1104	9.6	1	2 HE	OTTO	IV
91110501	91 1105	9.6	1	4 PR	OTTO	IV
91110601	91 1106	9.0	1	12 PO	CHOI	ES
91110701	91 1107	8.7	1	1 CN	JELL	PS
91110801	91 1108	9.3	1	1 AR	LEAN	NB
91110802	91 1108	9.3	2	3 PR	OTTO	IV
91110901	91 1109	9.4	1	1 AR	LEAN	NB
91110902	91 1109	9.4	2	1 PO	VAUX	ES
91111101	91 1111	9.0	1	1 AR	LEAP	NB

RAYMOND_QUARRY

91111201	91 1112	9.0	1	1 AR	LEAN	NB
91111301	91 1113	9.4	1	1 AR	ANOM	PS
91111401	91 1114	9.7	1	1 CN	MACK	ES
91111402	91 1114	9.7	2	1 AR	INAR	UN
91111501	91 1115	9.4	1	1 AR	TUZO	UN
91111601	91 1116	9.0	1	1 AR	LEAN	NB
91111701	91 1117	9.5	1	1 AR	WAPT	NB
91111702	91 1117	9.5	2	1 AR	INAR	UN
91111703	91 1117	9.5	3	1 PO	VAUX	ES
91111704	91 1117	9.5	4	1 PR	OTTO	IV
91111705	91 1117	9.5	5	3 AR	ALUT	PS
91111901	91 1119	11.5	1	1 AR	HURD	PS
91111801	91 1118	10.9	1	1 AR	LEAN	NB
91112001	91 1120	9.8	1	1 PR	OTTO	IV
91112002	91 1120	9.8	2	1 AR	INAR	UN
91112101	91 1121	9.1	1	1 AR	LEAN	NB
91112201	91 1122	8.9	1	3 PO	CHOI	ES
91112401	91 1124	9.0	1	1 AR	ANOM	PS
91112501	91 1125	9.1	1	1 AR	LEAN	NB
91112601	91 1126	10.8	1	1 AR	NARA	EV
91112701	91 1127	9.1	1	3 PO	CHOI	ES
91112801	91 1128	9.4	1	1 AR	ISOX	PS
91112802	91 1128	9.4	2	1 UN	POLL	UN
91112901	91 1129	9.4	1	1 AR	ISOX	PS
91113001	91 1130	9.0	1	1 AR	LEAP	NB
91113101	91 1131	9.0	1	1 AR	LEAN	NB
91113201	91 1132	9.0	1	1 AR	LEAN	NB
91113202	91 1132	9.0	2	1 AR	LEAN	NB
91113301	91 1133	9.0	1	1 AR	SIDN	NB
91113401	91 1134	9.1	1	1 AR	TUZO	UN
91113701	91 1137	9.0	1	1 AR	LEAN	NB
91113702	91 1137	9.0	2	1 UN	INDE	UN
91113801	91 1138	9.0	1	1 AR	SIDN	NB
91113802	91 1138	9.0	2	1 PO	VAUX	ES
91113601	91 1136	9.9	1	1 AR	LEAN	NB
91114001	91 1140	9.0	1	1 AR	LEAN	NB
91114002	91 1140	9.0	2	1 PR	OTTO	IV
91114101	91 1141	9.0	1	62 PO	CHOI	ES
91114201	91 1142	11.3	1	1 AR	SEAM	PS
91114202	91 1142	11.3	2	2 PR	OTTO	IV
91114203	91 1142	11.3	3	4 UN	POLL	UN
91114204	91 1142	11.3	4	1 AR	HURD	PS
91114301	91 1143	9.3	1	1 AR	SKAN	EV
91114401	91 1144	9.0	1	1 AR	WAPT	NB
91114402	91 1144	9.0	2	1 AR	LEAN	NB
91114501	91 1145	9.8	1	1 AR	LEAN	NB
91114601	91 1146	8.9	1	1 EC	CREE	EV
91114701	91 1147	10.4	1	1 AR	HURD	PS
91114702	91 1147	10.4	2	1 AR	INAR	UN
91114703	91 1147	10.4	3	1 AR	INAR	UN
91114901	91 1149	8.7	1	1 PR	OTTO	IV

RAYMOND_QUARRY

91115001	91 1150	9.6	1	1 AR	SIDN	NB
91115401	91 1154	9.0	1	13 PR	OTTO	IV
91115601	91 1156	8.9	1	1 AR	ISOX	PS
91115701	91 1157	8.8	1	1 AR	APPF	PS
91115801	91 1158	8.9	1	1 UN	INDE	UN
91115501	91 1155	9.9	1	2 AR	ANOM	PS
91116001	91 1160	9.8	1	1 CN	JELL	PS
91116002	91 1160	9.8	2	1 PR	OTTO	IV
91116101	91 1161	9.6	1	2 AR	LEAN	NB
91116102	91 1161	9.6	2	1 AR	WAPT	NB
91116201	91 1162	8.8	1	1 AR	LEAN	NB
91116301	91 1163	9.4	1	1 AR	LEAN	NB
91116302	91 1163	9.4	2	1 AR	LEAN	NB
91116401	91 1164	8.8	1	1 PR	OTTO	IV
91116402	91 1164	8.8	2	1 AR	LEAN	NB
91116501	91 1165	9.8	1	1 AR	INAR	UN
91116601	91 1166	8.2	1	1 PO	CHOI	ES
91116701	91 1167	8.9	1	1 AR	LEAN	NB
91116801	91 1168	8.7	1	1 AR	SIDN	NB
91116901	91 1169	9.1	1	2 AR	ANOM	PS
91117001	91 1170	8.9	1	1 AR	HURD	PS
91117002	91 1170	8.9	2	2 PO	VAUX	ES
91117101	91 1171	8.9	1	1 AR	SIDN	NB
91117102	91 1171	8.9	2	1 PO	VAUX	ES
91117201	91 1172	8.8	1	1 PO	VAUX	ES
91117301	91 1173	9.2	1	1 AR	LEAN	NB
91117302	91 1173	9.2	2	1 AR	ISOX	PS
91117303	91 1173	9.2	3	4 UN	POLL	UN
91117401	91 1174	9.2	1	12 AR	ALUT	PS
91117402	91 1174	9.2	2	1 AR	PAGE	PS
91117403	91 1174	9.2	3	1 AR	WAPT	NB
91117501	91 1175	8.9	1	1 PO	VAUX	ES
91117502	91 1175	8.9	2	1 PO	CHOI	ES
91117601	91 1176	9.2	1	1 AR	SIDN	NB
91117701	91 1177	9.1	1	1 AR	PAGE	PS
91117901	91 1179	8.8	1	2 AR	AGNO	PS
91117801	91 1178	9.8	1	1 AR	HABB	EV
91118001	91 1180	8.8	1	1 AR	SIDN	NB
91118301	91 1183	10.3	1	1 AR	LEAN	NB
91118302	91 1183	10.3	2	1 PO	VAUX	ES
91119101	91 1191	10.4	1	1 AR	LEAN	NB
91118601	91 1186	9.4	1	2 AR	LEAN	NB
91118602	91 1186	9.4	2	1 PR	OTTO	IV
91118603	91 1186	9.4	3	8 UN	POLL	UN
91119001	91 1190	10.5	1	1 AR	LEAN	NB
91119301	91 1193	8.8	1	1 AR	LEAN	NB
91119201	91 1192	8.8	1	1 MO	HAPL	EV
91119202	91 1192	8.8	2	1 BR	MICR	ES
91119401	91 1194	8.8	1	1 AR	ANOM	PS
91119501	91 1195	8.8	1	1 AR	LEAN	NB
91119502	91 1195	8.8	2	1 PO	VAUX	ES

RAYMOND_QUARRY

91119601	91 1196	8.8	1	1 AR	LEAN	NB
91119701	91 1197	10.3	1	1 UN	INDE	UN
91119801	91 1198	9.0	1	1 AR	INAR	UN
91120001	91 1200	10.5	1	1 AR	ISOX	PS
91120101	91 1201	9.8	1	1 AR	LEAN	NB
911201	91 1201	9.8	2	1 AR	ISOX	PS
91120102	91 1201	8.8	1	1 AR	SIDN	NB
91120301	91 1203	8.8	1	1 AR	LEAN	NB
91120401	91 1204	10.8	1	1 AR	OPAB	PS
91120501	91 1205	8.8	1	2 AR	ANOM	PS
91120601	91 1206	8.8	1	1 CN	JELL	PS
91120602	91 1206	8.8	2	1 PR	OTTO	IV
91120801	91 1208	9.3	1	1 AR	LEAP	NB
91121001	91 1210	9.1	1	1 AR	LEAN	NB
91121101	91 1211	8.8	1	1 AR	ANOM	PS
91120701	91 1207	8.8	1	1 AR	TUZO	UN
91120901	91 1209	9.0	1	1 AR	LEAP	NB
91121201	91 1212	11.1	1	5 PR	OTTO	IV
91121301	91 1213	8.8	1	1 AR	LEAN	NB
91121302	91 1213	8.8	2	1 AR	WAPT	NB
91121401	91 1214	9.4	1	1 AR	LEAN	NB
91121402	91 1214	9.4	2	1 PR	OTTO	IV
91121403	91 1214	9.4	3	2 AR	ISOX	PS
91121404	91 1214	9.4	4	1 UN	POLL	UN
91121501	91 1215	10.0	1	1 UN	INDE	UN
91121601	91 1216	8.9	1	4 PO	CHAN	ES
91121801	91 1218	8.8	1	1 PR	OTTO	IV
91121901	91 1219	8.8	1	1 AR	LEAN	NB
91122101	91 1221	9.3	1	1 AR	SIDN	NB
91122201	91 1222	9.3	1	1 AR	HURD	PS
91122202	91 1222	9.3	2	1 PO	VAUX	ES
91122301	91 1223	9.0	1	1 AR	DART	NB
91122302	91 1223	9.0	2	6 PR	OTTO	IV
91122303	91 1223	9.0	3	1 AR	ANOD	PS
91122401	91 1224	10.5	1	1 PO	TAKA	ES
91122501	91 1225	10.5	1	1 AR	APPF	PS
91122502	91 1225	10.5	2	1 AR	OLEN	EV
91122601	91 1226	10.3	1	1 AR	HURD	PS
91122801	91 1228	10.5	1	1 PR	OTTO	IV
91122701	91 1227	10.5	1	2 PR	OTTO	IV
91122901	91 1229	8.6	1	1 AR	OLEN	EV
91123201	91 1232	9.8	1	2 PR	OTTO	IV
91123401	91 1234	8.9	1	1 AR	APPF	PS
91123501	91 1235	8.9	1	1 AR	OLEN	EV
91123601	91 1236	9.8	1	1 AR	HELM	EV
91123602	91 1236	9.8	2	1 PO	HAZE	ES
91123603	91 1236	9.8	3	1 AR	ALUT	PS
91123701	91 1237	9.0	1	1 PR	OTTO	IV
91123702	91 1237	9.0	2	2 PO	CHAN	ES
91123801	91 1238	9.2	1	1 AR	SIDN	NB
91123802	91 1238	9.2	2	5 PO	VAUX	ES

RAYMOND_QUARRY

91123803	91 1238	9.2	3	2 PR	OTTO	IV
91123804	91 1238	9.2	4	14 PO	CHAN	ES
91123901	91 1239	10.0	1	1 AR	INAR	UN
91123902	91 1239	10.0	2	1 PO	VAUX	ES
91124001	91 1240	9.8	1	2 CN	JELL	PS
91124002	91 1240	9.8	2	4 AR	ALUT	PS
91124101	91 1241	9.2	1	1 AR	TUZO	UN
91124201	91 1242	8.8	1	1 AR	LEAN	NB
91124202	91 1242	8.8	2	1 AR	NARA	EV
91124203	91 1242	8.8	3	1 AR	ISOX	PS
91124204	91 1242	8.8	4	1 UN	POLL	UN
91124301	91 1243	8.9	1	1 AR	LEAN	NB
91124401	91 1244	9.2	1	2 AR	LEAN	NB
91124402	91 1244	9.2	2	1 PR	OTTO	IV
91124403	91 1244	9.2	4	1 VA	SHEL	SH
91124501	91 1245	8.9	1	1 AR	LEAN	NB
91124502	91 1245	8.9	2	1 AN	TUBU	ES
91124503	91 1245	8.9	3	1 HE	HELC	EV
91124504	91 1245	8.9	4	1 VA	SHEL	SH
91124601	91 1246	9.0	1	1 AR	LEAN	NB
91124801	91 1248	9.0	1	1 PO	CHAN	ES
91124802	91 1248	9.0	2	1 AR	ISOX	PS
91124901	91 1249	8.7	1	1 AR	LEAN	NB
91125001	91 1250	8.8	1	1 AR	EMER	EV
91125002	91 1250	8.8	2	2 UN	POLL	UN
91125101	91 1251	10.4	1	1 AR	LEAN	NB
91125201	91 1252	9.0	1	1 AR	AGNO	PS
91125301	91 1253	8.8	1	1 AR	OLEN	EV
91125401	91 1254	11.2	1	1 AR	HURD	PS
91125402	91 1254	11.2	2	1 AR	LEAN	NB
91125801	91 1258	8.8	1	1 AR	HURD	PS
91125802	91 1258	8.8	2	1 AR	LEAN	NB
91125601	91 1256	8.8	1	1 AR	LEAN	NB
91125701	91 1257	8.8	1	1 AR	LEAN	NB
91125501	91 1255	10.9	1	1 AR	LEAN	NB
91125901	91 1259	8.8	1	1 AR	LEAN	NB
91125902	91 1250	8.8	2	1 PO	VAUX	ES
91125903	91 1259	8.8	3	2 AR	ALUT	PS
91126001	91 1260		1	1 AR	LEAN	NB
91126002	91 1260	9.0	2	1 AR	LEAN	NB
91126101	91 1261	9.0	1	1 AR	LEAN	NB
91126102	91 1261	8.8	2	1 AR	LEAN	NB
91126201	91 1262	9.0	1	1 PR	OTTO	IV
91126301	91 1263	10.5	1	1 AR	LEAN	NB
91126401	91 1264	10.4	1	2 AR	LEAN	NB
91126501	91 1265	8.7	1	1 AR	OPAB	PS
91126601	91 1266	10.7	1	1 AR	LEAN	NB
91126801	91 1268	11.2	1	1 PR	OTTO	IV
91127001	91 1270	9.0	1	2 PO	CHAN	ES
91127002	91 1270	9.0	2	4 PO	CHAN	ES
91127003	91 1270	9.0	3	1 PR	OTTO	IV

RAYMOND_QUARRY

91127004	91 1270	9.0	4	1 PO	VAUX	ES
91127005	91 1270	9.0	5	1 BR	MICR	ES
91127201	91 1272	9.2	1	1 AR	SIDN	NB
91127202	91 1272	9.2	2	2 PO	VAUX	ES
91127301	91 1273	11.0	1	1 AR	LEAN	NB
91127401	91 1274	11.1	1	2 AR	LEAN	NB
91127501	91 1275	11.1	1	1 AR	INAR	UN
91127502	91 1275	11.1	2	3 AR	PAGE	PS
91127503	91 1275	11.1	3	1 AR	ALUT	PS
91127601	91 1276	9.0	1	1 AR	SIDN	NB
91127901	91 1279	18.3	1	2 AR	ANOM	PS
91127701	91 1277	9.0	1	1 AR	SIDN	NB
91127702	91 1277	9.0	2	1 PO	VAUX	ES
91127703	91 1277	9.0	3	2 UN	POLL	UN
91128001	91 1280	9.0	1	1 AR	LEAN	NB
91128101	91 1281	11.0	1	1 AR	LEAN	NB
91128102	91 1281	11.0	2	2 PR	OTTO	IV
91128201	91 1282	11.2	1	1 AR	ANOM	PS
91128301	91 1283	11.0	1	1 UN	KNOB	UN
91128401	91 1284	11.2	1	1 AR	LEAN	NB
91128501	91 1285	9.0	1	1 AR	AGNO	PS
91128502	91 1285	9.0	2	1 PO	CHAN	ES
91128601	91 1286	9.0	1	1 EC	CREE	EV
91128701	91 1287	9.0	1	3 PR	OTTO	IV
91128801	91 1288	11.9	1	1 AR	APPF	PS
91128901	91 1289	9.0	1	1 AR	ANOM	PS
91129101	91 1291	9.1	1	1 AR	INAR	UN
91129001	91 1290	11.0	1	1 AR	LEAN	NB
91129002	91 1290	11.0	2	1 PO	VAUX	ES
91129201	91 1292	8.9	1	1 AR	LEAN	NB
91129301	91 1293	9.0	1	2 AR	WAPT	NB
91129401	91 1294	9.1	1	1 PO	VAUX	ES
91129501	91 1295	9.0	1	1 PR	OTTO	IV
91129601	91 1296	11.8	1	1 AR	LEAN	NB
91129701	91 1297	10.9	1	1 UN	INDE	UN
91129801	91 1298	10.4	1	1 AR	HURD	PS
91129901	91 1299	10.9	1	1 AR	SIDN	NB
91129902	91 1299	10.9	2	1 VA	SHEL	SH
91130001	91 1300	9.2	1	1 AR	LEAN	NB
91130101	91 1301	9.4	1	2 AR	LEAN	NB
91130102	91 1301	9.4	2	1 PO	VAUX	ES
91130103	91 1301	9.4	3	2 AR	ISOX	PS
91130201	91 1302	10.8	1	1 AR	LEAN	NB
91130301	91 1303	9.4	1	1 AR	LEAN	NB
91130401	91 1304	8.8	1	1 AR	LEAN	NB
91130501	91 1305	11.9	1	1 AR	LEAN	NB
91130601	91 1306	11.1	1	1 AR	LEAN	NB
91130701	91 1307	9.1	1	1 UN	INDE	UN
91130801	91 1308	11.2	1	1 AR	OPAB	PS
91130901	91 1309	10.3	1	1 UN	INWO	UN
91131001	91 1310	8.9	1	1 AR	OLEN	EV

RAYMOND_QUARRY

91131002	91 1310	8.9	2	1 PO	VAUX	ES
91131003	91 1310	8.9	3	1 AR	APPF	PS
91131201	91 1312	9.0	1	1 AR	AGNO	PS
91131301	91 1313	8.9	1	1 PR	OTTO	IV
91131401	91 1314	9.4	1	1 AR	ANOM	PS
91131501	91 1315	8.9	1	2 PR	OTTO	IV
91131502	91 1315	8.9	2	1 BR	MICR	ES
91131503	91 1315	8.9	3	3 AN	TUBU	ES
91131601	91 1316	8.9	1	1 HE	ANOM	PS
91131701	91 1317	8.9	1	1 AR	HURD	PS
91131801	91 1318	8.9	1	1 AR	LEAN	NB
91132001	91 1320	9.0	1	1 PO	CHAN	ES
91132002	91 1320	9.0	2	3 PO	CHAN	ES
91132003	91 1320	9.0	3	1 PO	VAUX	ES
91132101	91 1321	9.0	1	2 PO	CHAN	ES
91132102	91 1321	9.0	2	2 PO	CHAN	ES
91132201	91 1322	9.0	1	2 PO	CHAN	ES
91132202	91 1322	9.0	2	1 PR	OTTO	IV
91132301	91 1323	11.4	1	1 AR	LEAN	NB
91132401	91 1324	10.8	1	1 AR	INAR	UN
91132501	91 1325	9.8	1	1 AR	LEAN	NB
91132601	91 1326	9.0	1	3 PO	CHAN	ES
91132602	91 1326	9.0	2	1 PO	VAUX	ES
91132701	91 1327	11.1	1	1 CN	JELL	PS
91132801	91 1328	9.8	1	1 AR	LEAN	NB
91132901	91 1329	11.0	1	1 AR	HURD	PS
91132902	91 1329	11.0	2	1 VA	SHEL	SH
91133001	91 1330	8.8	1	1 AR	LEAN	NB
91133101	91 1331	11.2	1	2 PR	OTTO	IV
91133102	91 1331	11.2	2	5 PR	OTTO	IV
91133201	91 1332	11.4	1	1 AR	LEAN	NB
91133301	91 1333	11.2	1	1 AR	LEAN	NB
91133401	91 1334	9.2	1	1 AR	SIDN	NB
91133501	91 1335	11.2	1	1 AR	CARN	UN
91133701	91 1337	8.8	1	1 AR	TUZO	UN
91133601	91 1336	11.0	1	1 AR	INAR	UN
91133901	91 1339	8.8	1	1 AR	AGNO	PS
91134001	91 1340	10.6	1	5 PO	VAUX	ES
91134101	91 1341	11.4	1	1 AR	NECT	PS
91134201	91 1342	11.4	1	1 AR	NECT	PS
91134301	91 1343	11.1	1	1 AR	SEAM	PS
91134401	91 1344	10.9	1	1 PR	OTTO	IV
91134402	91 1344	10.9	2	1 UN	INDE	UN
91134501	91 1345	8.9	1	1 PO	CHAN	ES
91134502	91 1345	8.9	2	1 AR	ANOD	PS
91134503	91 1345	8.9	3	3 UN	POLL	UN
91134601	91 1346	10.9	1	1 PR	OTTO	IV
91134701	91 1347	9.4	1	1 AR	LEAN	NB
91134801	91 1348	9.3	1	1 PO	CHAN	ES
91134901	91 1349	8.8	1	1 AR	LEAN	NB
91135001	91 1350	9.4	1	1 AR	LEAN	NB

RAYMOND_QUARRY

91135101	91 1351	10.9	1	1 AR	WAPT	NB
91135102	91 1351	10.9	2	3 PR	OTTO	IV
91135201	91 1352	10.9	1	1 AR	ANOD	PS
91135301	91 1353	9.0	1	1 PO	CHAN	ES
91135401	91 1354	11.2	1	1 AR	SIDN	NB
91135402	91 1354	11.2	2	1 PR	OTTO	IV
91135403	91 1354	11.2	3	1 PO	VAUX	ES
91135501	91 1355	10.9	1	1 AR	LEAN	NB
91135601	91 1356	11.0	1	1 CN	JELL	PS
91135602	91 1356	11.0	2	1 AR	LEAN	NB
91135701	91 1357	11.2	1	1 CN	MACK	ES
91135901	91 1359	8.8	1	1 PR	OTTO	IV
91136001	91 1360	11.1	1	1 AR	LEAN	NB
91136101	91 1361	11.4	1	1 AR	LEAN	NB
91136301	91 1363	11.1	1	1 UN	INDE	UN
91136302	91 1363	11.1	2	1 AR	INAR	UN
91136303	91 1363	11.1	3	1 AR	LEAN	NB
91136401	91 1364	9.3	1	2 AR	ANOM	PS
91136402	91 1364	9.3	2	1 AR	HURD	PS
91136501	91 1365	11.4	1	1 AR	APPF	PS
91136502	91 1365	11.4	2	3 BR	MICR	ES
91136503	91 1365	11.4	3	1 AR	HURD	PS
91136601	91 1366	9.0	1	1 AR	ANOM	PS
91136701	91 1367	10.4	1	1 AR	WAPT	NB
91136702	91 1367	10.4	2	1 AR	LEAN	NB
91136703	91 1367	10.4	3	1 PO	VAUX	ES
91136801	91 1368	8.8	1	1 AR	SIDN	NB
91136802	91 1368	8.8	2	1 PR	OTTO	IV
91136901	91 1369	8.8	1	2 AR	HURD	PS
91137001	91 1370	10.8	1	11 PR	OTTO	IV
91137701	91 1377	9.3	1	1 AR	LEAN	NB
91137801	91 1378	LO	1	3 PR	OTTO	IV
91138001	91 1380	9.3	1	1 AR	LEAN	NB
91138002	91 1380	9.3	2	1 UN	INWO	UN
91137901	91 1379	9.3	1	1 AR	ISOX	PS
91138101	91 1381	9.3	1	1 AR	TUZO	UN
91138201	91 1382	11.1	1	2 PR	OTTO	IV
91138202	91 1382	11.1	2	1 AR	LEAN	NB
91138203	91 1382	11.1	3	1 UN	INDE	UN
91138401	91 1384	8.9	1	1 AR	LEAN	NB
91138501	91 1385	9.3	1	1 AR	LEAP	NB
91138301	91 1383	LO	1	2 AR	APPF	PS
91138601	91 1386	10.4	1	2 AR	LEAN	NB
91138602	91 1386	10.4	2	1 PR	OTTO	IV
91138701	91 1387	9.4	1	1 AR	LEAN	NB
91138801	91 1388	8.7	1	1 AR	LEAP	NB
91138901	91 1389	11.0	1	2 CN	JELL	PS
91139101	91 1391	9.1	1	1 PO	CHAN	ES
91139102	91 1391	9.1	2	2 PO	VAUX	ES
91139201	91 1392	10.8	1	1 AR	LEAN	NB
91139301	91 1393	11.2	1	1 AR	LEAP	NB

RAYMOND_QUARRY

91139501	91 1395	11.0	1	1 AR	LEAN	NB
91139601	91 1396	11.2	1	1 AR	SIDN	NB
91139701	91 1397	10.8	1	1 AR	HURD	PS
91139702	91 1397	10.8	2	9 AR	PAGE	PS
91139703	91 1397	10.8	3	1 AR	ALUT	PS
91139801	91 1398	9.3	1	1 AR	APPF	PS
91139901	91 1399	11.1	1	2 AN	TUBU	ES
91140001	91 1400	10.9	1	1 HE	ANOD	PS
91140101	91 1401	9.1	1	1 PR	OTTO	IV
91140102	91 1401	9.1	2	1 PO	VAUX	ES
91140103	91 1401	9.1	3	1 VA	SHEL	SH
91140201	91 1402	9.3	1	1 AR	WAPT	NB
91140202	91 1402	9.3	2	1 PO	VAUX	ES
91140203	91 1402	9.3	3	1 UN	POLL	UN
91140401	91 1404	9.5	1	1 AR	WAPT	NB
91140402	91 1404	9.5	2	1 PO	CHAN	ES
91140403	91 1404	9.5	3	1 UN	INDE	UN
91140501	91 1405	11.2	1	1 AR	LEAP	NB
91140601	91 1406	10.7	1	1 AR	LEAN	NB
91140602	91 1406	10.7	2	1 PR	OTTO	IV
91140701	91 1407	10.9	1	1 AR	LEAN	NB
91140801	91 1408	8.8	1	1 AR	HURD	PS
91101501	91 1015	9.0	1	1 AR	HURD	PS
91141601	91 1416	11.2	1	1 CN	JELL	PS
91141602	91 1416	11.2	2	1 AR	LEAN	NB
91141701	91 1417	9.0	1	7 PO	CHAN	ES
91141702	91 1417	9.0	2	1 PO	VAUX	ES
91141801	91 1418	10.8	1	1 AR	ANOD	PS
91141901	91 1419	9.4	1	1 AR	SIDN	NB
91141902	91 1419	9.4	2	2 AR	ANOM	PS
91141903	91 1419	9.4	3	1 AR	LEAN	NB
91142001	91 1420	9.3	1	1 AR	SIDN	NB
91142101	91 1421	9.5	1	6 PO	VAUX	ES
91142102	91 1421	9.5	2	1 EC	CREE	EV
91142201	91 1422	9.6	1	1 AR	LEAN	NB
91142301	91 1423	9.7	1	1 AR	SIDN	NB
91142401	91 1424	10.4	1	1 AR	APPF	PS
91142501	91 1425	9.5	1	1 AR	ISOX	PS
91142601	91 1426	9.5	1	1 AR	LEAN	NB
91142701	91 1427	10.8	1	1 AR	LEAN	NB
91142801	91 1428	9.1	1	1 CN	MACK	ES
91142802	91 1428	9.1	2	1 PO	VAUX	ES
91142901	91 1429	9.5	1	1 PO	VAUX	ES
91142902	91 1429	9.5	2	1 UN	POLL	UN
91143001	91 1430	9.4	1	1 AR	ANOM	PS
91143101	91 1431	9.7	1	1 AR	LEAN	NB
91143102	91 1431	9.7	2	1 AR	LEAN	NB
91143201	91 1432	9.6	1	1 AR	LEAN	NB
91143202	91 1432	9.6	2	1 UN	INDE	UN
91143203	91 1432	9.6	3	1 PO	VAUX	ES
91143204	91 1432	9.6	4	1 AN	TUBU	ES

RAYMOND_QUARRY

91143205	91 1432	9.6	5	1 HE	APPF	PS
91143301	91 1433	9.6	1	1 AR	LEAN	NB
91143401	91 1434	9.1	1	1 PO	HAZE	ES
91143501	91 1435	8.9	1	1 AR	LEAN	NB
91143502	91 1435	8.9	2	1 PR	OTTO	IV
91143601	91 1436	10.4	1	1 PR	OTTO	IV
91143701	91 1437	9.5	1	2 UN	POLL	UN
91143702	91 1437	9.5	2	1 UN	INDE	UN
91143801	91 1438	9.4	1	1 EC	CREE	EV
91143802	91 1438	9.4	2	1 PO	VAUX	ES
91143901	91 1439	9.5	1	1 AR	ANOM	PS
91144001	91 1440	9.4	1	1 AR	APPF	PS
91144101	91 1441	10.5	1	1 AR	INAR	UN
91144102	91 1441	10.5	2	1 AR	LEAN	NB
91144103	91 1441	10.5	3	1 VA	SHEL	SH
91144201	91 1442	9.7	1	7 PR	OTTO	IV
91144301	91 1443	9.7	1	5 PR	OTTO	IN
91144401	91 1444	10.6	1	3 PR	OTTO	IV
91144501	91 1445	9.4	1	1 AR	HURD	PS
91144601	91 1446	9.6	1	2 PO	CHAN	ES
91144701	91 1447	8.4	1	1 AR	LEAN	NB
91144702	91 1447	8.4	2	1 AR	LEAN	NB
91144703	91 1447	8.4	3	1 AR	SIDN	NB
91144801	91 1448	9.6	1	1 AR	LEAN	NB
91144802	91 1448	9.6	2	1 UN	POLL	UN
91144803	91 1448	9.6	3	1 UN	INDE	UN
91144901	91 1449	9.4	1	1 AR	ANOM	PS
91145001	91 1450	10.8	1	1 AR	LEAP	NB
91145101	91 1451	9.4	1	1 AR	SIDN	NB
91145102	91 1451	9.4	2	3 UN	POLL	UN
91145103	91 1451	9.4	3	1 AL	INAL	UN
91145201	91 1452	10.0	1	1 AR	HURD	PS
91145301	91 1453	8.5	1	1 AR	LEAN	NB
91145501	91 1455	11.4	1	1 AR	SIDN	NB
91145601	91 1456	9.4	1	1 AR	HURD	PS
91145701	91 1457	9.2	1	1 AR	HURD	PS
91145702	91 1457	9.2	2	1 PO	CHAN	ES
91145801	91 1458	10.9	1	1 PR	OTTO	IV
91145802	91 1458	10.9	2	2 AR	LEAN	NB
91145901	91 1459	11.2	1	1 PR	OTTO	IV
91145902	91 1459	11.2	2	7 AR	ALUT	PS
91146001	91 1460	8.9	1	1 AR	LEAN	NB
91146101	91 1461	9.1	1	5 PO	CHAN	ES
91146102	91 1461	9.1	2	8 PO	CHAN	ES
91146201	91 1462	9.0	1	1 AR	SIDN	NB
91146202	91 1462	9.0	2	1 PO	VAUX	ES
91146301	91 1463	8.9	1	1 AR	LEAN	NB
91146401	91 1464	9.2	1	3 PO	CHAN	ES
91146402	91 1464	9.2	2	1 PO	VAUX	ES
91146501	91 1465	9.6	1	1 PR	OTTO	IV
91146701	91 1467	8.9	1	1 PO	VAUX	ES

RAYMOND_QUARRY

91146702	91 1467	8.9	2	1 AN	TUBU	ES
91146703	91 1467	8.9	3	1 HE	HAZE	ES
91146704	91 1467	8.9	4	1 VA	SHEL	SH
91147001	91 1470	10.4	1	1 AR	LEAN	NB
91147002	91 1470	10.4	2	1 AR	ALUT	PS
91146601	91 1466	9.6	1	1 PR	OTTO	IV
91146801	91 1468	9.6	1	1 PO	VAUX	ES
91147101	91 1471	10.4	1	1 AR	NECT	PS
91147401	91 1474	9.4	1	1 AR	ANOM	PS
91147501	91 1475	9.0	1	1 AR	LEAN	NB
91147502	91 1475	9.0	2	9 UN	POLL	UN
91147503	91 1475	9.0	3	10 AR	ALUT	PS
91147301	91 1473	9.8	1	1 AR	LEAN	NB
91147302	91 1473	9.8	2	1 PR	OTTO	IV
91147201	91 1472	9.4	1	1 AR	LEAN	NB
91147202	91 1472	9.4	2	5 UN	POLL	UN
91147701	91 1477	9.2	1	1 AR	SIDN	NB
91147601	91 1476	10.4	1	1 AR	SIDN	NB
91147801	91 1478	9.1	1	1 AR	LEAN	NB
91147901	91 1479	8.9	1	1 AR	LEAN	NB
91148001	91 1480	10.3	1	1 AR	SIDN	NB
91148101	91 1481	11.3	1	5 PR	OTTO	IV
91148201	91 1482	10.4	1	1 PR	OTTO	IV
91148202	91 1482	10.4	2	1 AR	LEAN	NB
91148301	91 1483	9.2	1	8 PO	CHAN	ES
91148302	91 1483	9.2	2	2 PO	VAUX	ES
91148303	91 1483	9.2	3	1 BR	MICR	ES
91148401	91 1484	9.8	1	1 CN	JELL	PS
91148501	91 1485	10.3	1	1 AR	SIDN	NB
91148601	91 1486	10.4	1	1 AR	SIDN	NB
91148602	91 1486	10.4	2	1 PO	VAUX	ES
91148603	91 1486	10.4	3	1 UN	POLL	UN
91148701	91 1487	9.3	1	1 AR	HURD	PS
91148702	91 1487	9.3	2	2 PO	VAUX	ES
91148801	91 1488	9.8	1	2 AR	LEAN	NB
91148802	91 1488	9.8	2	1 AR	ANOM	PS
91148803	91 1488	9.8	3	1 AR	INAR	UN
91148901	91 1489	9.3	1	6 PR	OTTO	IV
91149101	91 1491	10.3	1	1 AR	ANOD	PS
91149201	91 1492	10.5	1	1 AR	LEAN	NB
91149301	91 1493	10.3	1	1 AR	SIDN	NB
91149401	91 1494	10.4	1	1 AR	ISOX	PS
91149501	91 1495	10.4	1	1 AR	SEAM	PS
91149601	91 1496	10.0	1	1 AR	TUZO	UN
91149701	91 1497	10.4	1	1 AR	APPF	PS
91149801	91 1498	10.2	1	1 AR	LEAN	NB
91149901	91 1499	10.0	1	1 AR	LEAN	NB
91149902	91 1499	10.0	2	2 AR	ALUT	PS
91150001	91 1500	10.0	1	1 CN	JELL	PS
91150002	91 1500	10.0	2	2 MO	HAPL	EV
91150401	91 1504	8.9	1	1 AR	LEAN	NB

RAYMOND_QUARRY

91150402	91 1504	8.9	2	1 PR	OTTO	IV
91150201	91 1502	9.2	1	1 PO	VAUX	ES
91150101	91 1501	9.1	1	1 AR	LEAN	NB
91150301	91 1503	10.4	1	1 AR	LEAN	NB
91153201	91 1532		1	1 CN	JELL	PS
91153301	91 1533	NL	1	1 AR	WAPT	NB
91153302	91 1533	10.4	2	1 PO	VAUX	ES
91153303	91 1533	10.4	3	1 UN	INDE	UN
91153401	91 1534		1	1 AR	ANOM	PS
91153501	91 1535	NL	1	1 AR	ANOM	PS
91154101	91 1541	NL	1	1 AR	INAR	UN
91153901	91 1539	NL	1	1 PR	OTTO	IV
91153601	91 1536	NL	1	1 PR	OTTO	IV
91154001	91 1540		1	1 AR	LEAN	NB
91154201	91 1542	NL	1	1 AR	ANOM	PS
91118201	91 1182	NL	1	1 CN	JELL	PS
91118202	91 1182	8.8	2	1 CT	CTEN	PS
91141501	91 1415	10.4	1	1 AR	ANOM	PS
91046101	91 0461	8.1	1	1 AR	HELM	EV
91139401	91 1394	11.1	1	1 AR	LEAN	NB
91015501	91 0155	9.7	1	1 AR	LEAN	NB
9.1E+08	91 1041	9.9	1	1 PO	TAKA	ES
91104101	91 1390	11.1	1	1 AL	MARG	AA
91112301	91 1123	9.0	1	1 PO	VAUX	ES
91106001	91 1060	9.9	1	1 VA	SHEL	SH
91038401	91 0384	9.6	1	1 UN	INTU	UN
91038402	91 0384	9.6	2	1 PR	OTTO	IV
91111001	91 1110	9.7	1	1 AR	CHAP	EV
92000301	92 0003		1	1 PO	HAZE	ES
92000302	92 0003	NL	2	1 BR	MICR	ES
92002301	92 0023	NL	1	1 PO	VAUX	ES
92002401	92 0024	10.3	1	1 AR	LEAN	NB
92002402	92 0024	10.3	2	1 AR	LEAN	NB
92002501	92 0025		1	40 UN	POLL	UN
92002502	92 0025	NL	2	1 PR	OTTO	IV
92002503	92 0025	NL	3	1 AR	ISOX	PS
92002504	92 0025	NL	4	1 AR	CHAP	EV
92002601	92 0026	NL	1	7 PR	OTTO	IV
92002602	92 0026	NL	2	1 PO	VAUX	ES
92002701	92 0027	NL	1	1 AR	HURD	PS
92002702	92 0027	9.7	2	1 AR	LEAN	NB
92002703	92 0027	9.7	3	1 PO	VAUX	ES
92002704	92 0027	9.7	4	5 UN	POLL	UN
92002801	92 0028	9.6	1	1 AR	SIDN	NB
92002802	92 0028	9.6	2	2 AR	LEAN	NB
92002803	92 0028	9.6	3	1 PO	VAUX	ES
92002901	92 0029	10.4	1	1 PR	OTTO	IV
92003101	92 0031	10.4	1	1 PO	VAUX	ES
92003102	92 0031	10.4	2	1 AR	ALUT	PS
92003301	92 0033	9.5	1	2 AR	LEAN	NB
92003302	92 0033	9.5	2	1 VA	SHEL	SH

RAYMOND_QUARRY

92003401	92 0034	9.8	1	1 CN	MACK	ES
92003402	92 0034	9.8	2	1 AR	KOOT	EV
92003501	92 0035	10.6	1	1 AR	ISOX	PS
92003601	92 0036	10.4	1	1 AR	LEAN	NB
92003701	92 0037	10.4	1	1 PR	OTTO	IV
92003801	92 0038	9.6	1	1 AR	LEAN	NB
92003901	92 0039	9.5	1	2 PR	OTTO	IV
92003902	92 0039	9.5	2	2 PR	OTTO	IV
92003903	92 0039	9.5	3	1 AR	TUZO	UN
92003904	92 0039	9.5	4	1 PO	HAZE	ES
92004001	92 0040	10.4	1	1 PR	OTTO	IV
92004002	92 0040	10.4	2	2 MO	HAPL	EV
92004101	92 0041	10.3	1	1 AR	ANOD	PS
92004201	92 0042	10.4	1	1 PR	OTTO	IV
92004301	92 0043	9.8	1	1 UN	INDE	UN
92004401	92 0044	10.4	1	1 PR	OTTO	IV
92004501	92 0045	9.8	1	1 AR	LEAN	NB
92004601	92 0046	10.2	1	1 PR	OTTO	IV
92004701	92 0047	10.5	1	1 AR	APPF	PS
92004901	92 0049	10.5	1	1 AR	LEAN	NB
92005001	92 0050	10.4	1	1 AR	LEAN	NB
92005101	92 0051	10.5	1	1 UN	ICHN	IV
92005201	92 0052	10.6	1	1 PR	OTTO	IV
92005301	92 0053	10.5	1	1 UN	FECA	UN
92005401	92 0054	10.5	1	1 AL	INAL	UN
92005402	92 0054	10.5	2	1 UN	INDE	UN
92005501	92 0055	10.3	1	1 PR	OTTO	IV
92005601	92 0056	11.7	1	1 AR	DART	NB
92005701	92 0057	9.6	1	1 AR	LEAN	NB
92005801	92 0058	11.6	1	1 AR	LEAN	NB
92005802	92 0058	11.6	2	1 AR	PAGE	PS
92005803	92 0058	11.6	3	1 UN	INDE	UN
92005901	92 0059		1	2 PR	OTTO	IV
92006001	92 0060	NL	1	1 PR	OTTO	IV
92006101	92 0061	11.4	1	1 AR	LEAN	NB
92006201	92 0062	10.9	1	1 AR	LEAN	NB
92006301	92 0063	11.0	1	1 UN	INDE	UN
92006401	92 0064	11.0	1	1 PR	OTTO	IV
92006501	92 0065	11.0	1	1 UN	INDE	UN
92006601	92 0066	10.6	1	1 AR	LEAN	NB
92006701	92 0067	10.6	1	1 UN	INWO	UN
92006801	92 0068	11.4	1	1 AR	LEAN	NB
92006802	92 0068	11.4	2	9 UN	POLL	UN
92006901	92 0069	9.6	1	1 AR	ANOM	PS
92007001	92 0070	9.6	1	16 PO	VAUX	ES
92007101	92 0071	11.4	1	1 AR	HURD	PS
92007201	92 0072	9.3	1	1 AR	SIDN	NB
92007301	92 0073	11.5	1	1 AR	LEAN	NB
92007302	92 0073	11.5	2	1 MO	HAPL	EV
92007401	92 0074	11.6	1	1 AR	LEAN	NB
92007402	92 0074	11.6	2	1 VA	SHEL	SH

RAYMOND_QUARRY

92007501	92 0075	9.3	1	1 AR	SIDN	NB
92007502	92 0075	9.3	2	1 PO	VAUX	ES
92007503	92 0075	9.3	3	1 UN	POLL	UN
92007601	92 0076		1	2 PR	OTTO	IV
92007701	92 0077	NL	1	1 UN	INTU	UN
92007901	92 0079	9.6	1	2 PR	OTTO	IV
92008001	92 0080	12.0	1	1 AR	TUZO	UN
92008002	92 0080	12.0	2	1 VA	SHEL	SH
92008101	92 0081	10.4	1	5 PR	OTTO	IV
92008102	92 0081	10.4	2	1 AR	LEAN	NB
92008103	92 0081	10.4	3	1 AR	INAR	UN
92008201	92 0082	10.5	1	1 AR	HURD	PS
92008301	92 0083	12.0	1	1 PR	OTTO	IV
92008302	92 0083	12.0	2	1 VA	SHEL	SH
92008401	92 0084	10.7	1	2 AR	ANOM	PS
92008402	92 0084	10.7	2	1 PO	VAUX	ES
92008701	92 0087	12.0	1	1 AR	SIDN	NB
92008702	92 0087	12.0	2	1 VA	SHEL	SH
92008601	92 0086	10.6	1	1 AR	APPF	PS
92008801	92 0088	9.6	1	45 UN	POLL	UN
92008901	92 0089	12.0	1	1 AR	LEAN	NB
92008902	92 0089	12.0	2	1 VA	SHEL	SH
92009001	92 0090	10.1	1	1 AR	LEAN	NB
92009301	92 0093	10.6	1	2 UN	INWO	UN
92009401	92 0094	12.0	1	1 AR	APPF	PS
92009402	92 0094	12.0	2	1 VA	SHEL	SH
92009501	92 0095	12.0	1	2 MO	HAPL	EV
92009502	92 0095	12.0	2	5 MO	HAPL	EV
92009601	92 0096	9.5	1	1 PR	OTTO	IV
92009701	92 0097	9.0	1	1 PR	OTTO	IV
92009801	92 0098	9.2	1	1 AR	TUZO	UN
92009901	92 0099	10.0	1	1 AR	SIDN	NB
92010001	92 0100	11.0	1	1 AR	OLEN	EV
92010002	92 0100	11.0	2	1 AN	TUBU	ES
92010101	92 0101	9.9	1	1 HE	LEAN	NB
92010201	92 0102	10.2	1	1 AR	LEAN	NB
92010301	92 0103	9.0	1	1 AR	ANOM	PS
92010302	92 0103	9.0	2	1 VA	SHEL	SH
92010303	92 0103	9.0	3	1 PO	VAUX	ES
92010401	92 0104	9.0	1	1 AR	SIDN	NB
92010402	92 0104	9.0	1	2 UN	POLL	UN
92010501	92 0105	9.8	1	1 PO	TAKA	ES
92010601	92 0106	10.1	1	2 PR	OTTO	IV
92010602	92 0106	10.1	2	1 PO	VAUX	ES
92010701	92 0107	10.1	1	1 AR	APPF	PS
92010801	92 0108	9.3	1	1 AR	HURD	PS
92010901	92 0109	9.9	1	1 PO	TAKA	ES
92011001	92 0110		1	1 AR	ORYC	EV
92011101	92 0111	9.0	1	1 AR	LEAN	NB
92011201	92 0112	9.9	1	1 AR	SIDN	NB
92011301	91 0113	11.3	1	1 AR	LEAN	NB

RAYMOND_QUARRY

92011401	92 0114	9.5	1	1 AR	SIDN	NB
92011501	91 0115	9.8	1	1 AR	TUZO	UN
92011601	92 0116	12.1	1	1 AR	HURD	PS
92011602	92 0116	12.1	2	1 VA	SHEL	SH
92011701	92 0117	9.3	1	1 AR	SIDN	NB
92011801	92 0118	11.0	1	3 PR	OTTO	IV
92012101	92 0121	9.5	1	1 PO	VAUX	ES
92011901	92 0119	9.5	1	1 AR	SIDN	NB
92012201	92 0122	11.0	1	2 PR	OTTO	IV
92012001	92 0120	11.0	1	1 AR	LEAN	NB
92012301	92 0123	9.6	1	12 PR	OTTO	IV
92012401	92 0124	9.5	1	1 UN	INDE	UN
92012501	92 0125	10.5	1	2 PR	OTTO	IV
92012601	92 0126	11.8	1	1 AR	LEAN	NB
92012602	92 0126	11.8	2	1 AR	LEAN	NB
92013001	92 0130	11.5	1	1 AR	ANOD	PS
92013101	91 0131	11.8	1	1 AR	HURD	PS
92013201	92 0132	9.6	1	1 UN	INTU	UN
92012701	92 0127	11.4	1	2 CN	JELL	PS
92013301	92 0133	9.1	1	1 AR	ANOD	PS
92013401	92 0134	9.4	1	1 AR	ANOD	PS
92013501	92 0135	11.5	1	1 AR	LEAN	NB
92013701	92 0137	11.0	1	1 AR	APPF	PS
92013801	92 0138	10.4	1	1 PO	CHOI	ES
92013901	92 0139	9.6	1	1 AR	LEAN	NB
92014001	92 0140	9.4	1	1 AR	NARA	EV
92014101	92 0141	9.3	1	1 AR	HURD	PS
92014102	92 0141	9.3	2	1 UN	POLL	UN
92014201	92 0142	9.4	1	1 AR	SIDN	NB
92014301	92 0143	9.2	1	1 AR	HURD	PS
92014401	92 0144	10.5	1	2 CN	JELL	PS
92014501	92 0145	10.8	1	1 CN	JELL	PS
92014601	92 0146	9.4	1	1 CN	MACK	ES
92014701	92 0147	9.4	1	1 AR	WAPT	NB
92014801	92 0148	9.0	1	1 AR	SIDN	NB
92014901	92 0149	9.1	1	2 PO	CHOI	ES
92015001	92 0150	9.0	1	1 PR	OTTO	IV
92015101	92 0151	8.9	1	1 AR	LEAN	NB
92015201	92 0152	9.2	1	1 AR	SIDN	NB
92015301	92 0153	11.5	1	1 PO	CHOI	ES
92015401	92 0154	11.3	1	1 AR	ISOX	PS
92015501	92 0155	8.9	1	1 PR	OTTO	IV
92015502	92 0155	8.9	2	1 PO	VAUX	ES
92015601	92 0156	9.0	1	1 AR	SIDN	NB
92015602	92 0156	9.0	2	4 PO	VAUX	ES
92015603	92 0156	9.0	3	1 AR	INAR	UN
92015604	92 0156	9.0	4	1 BR	NISU	ES
92015701	92 0157	11.3	1	1 AR	SIDN	NB
92015702	92 0157	11.3	2	1 VA	SHEL	SH
92015801	92 0158	8.8	1	1 AR	SIDN	NB
92016101	92 0161	9.0	1	1 AR	HURD	PS

RAYMOND_QUARRY

92016301	92 0163	8.9	1	1 AR	HURD	PS
92016302	92 0163	8.9	2	1 MO	HAPL	EV
92016303	92 0163	8.9	3	1 PO	VAUX	ES
92016201	92 0162	8.9	1	1 AR	HURD	PS
92016202	92 0162	8.9	2	1 PR	OTTO	IV
92016203	92 0162	8.9	3	1 AR	AGNO	PS
92016401	92 0164	10.0	1	1 AR	HURD	PS
92016402	92 0164	10.0	2	1 UN	POLL	UN
92016601	92 0166	11.4	1	1 AR	LEAN	NB
92016901	92 0169	11.5	1	1 AR	LEAN	NB
92016701	92 0167	12.0	1	1 AR	LEAN	NB
92016801	92 0168	8.8	1	1 PO	CHAN	ES
92016802	92 0168	8.8	2	3 PO	CHAN	ES
92017001	92 0170	11.4	1	1 AR	LEAN	NB
92016501	92 0165	11.4	1	1 CN	JELL	PS
92016502	92 0165	11.4	2	1 CT	CTEN	PS
92017401	92 0174	10.1	1	1 AR	LEAN	NB
92017301	92 0173	8.7	1	1 AR	ANOM	PS
92017302	92 0173	8.7	2	1 AR	ISOX	PS
92017101	92 0171	11.0	1	1 CN	JELL	PS
92017201	92 0172	11.4	1	2 PR	OTTO	IV
92017601	92 0176	10.1	1	1 PR	OTTO	IV
92017701	92 0177	8.8	1	1 UN	INTU	UN
92017801	92 0178	8.8	1	1 AR	HURD	PS
92017901	92 0179		1	1 CN	JELL	PS
92018001	92 0180	11.4	1	2 PO	VAUX	ES
92018101	92 0181	10.2	1	1 AR	SIDN	NB
92018201	92 0182	8.8	1	1 AR	LEAN	NB
92018202	92 0182	8.8	2	1 PO	VAUX	ES
92018301	92 0183	8.8	1	1 AR	ISOX	PS
92018501	92 0185	8.7	1	2 PO	CHAN	ES
92018502	92 0185	8.7	2	1 PO	VAUX	ES
92018901	92 0189	8.8	1	1 AR	HURD	PS
92018401	92 0184	8.6	1	1 AL	INAL	UN
92019401	92 0194	9.2	1	1 PO	CHAN	ES
92019402	92 0194	9.2	2	1 VA	SHEL	SH
92019701	92 0197	8.8	1	1 PR	OTTO	IV
92019101	92 0191	11.4	1	1 AR	LEAN	NB
92019601	92 0196	8.8	1	1 AR	ANOM	PS
92019602	92 0196	8.8	2	1 PR	OTTO	IV
92019603	92 0196	8.8	3	1 PO	VAUX	ES
92019001	92 0190	8.6	1	1 AR	HURD	PS
92019002	92 0190	8.6	2	1 VA	SHEL	SH
92019801	92 0198	8.7	1	1 AR	SIDN	NB
92020001	92 0200	11.2	1	1 AR	SIDN	NB
92020002	92 0200	11.2	2	1 PR	OTTO	IV
92020003	92 0200	11.2	3	1 PO	VAUX	ES
92020201	92 0202	9.0	1	1 AR	SIDN	NB
92020202	92 0202	9.0	2	1 AR	TUZO	UN
92020203	92 0202	9.0	3	1 UN	INWO	UN
92020204	92 0202	9.0	4	1 PO	VAUX	ES

RAYMOND_QUARRY

92020401	92 0204	8.7	1	1 AR	LEAN	NB
92020402	92 0204	8.7	2	1 BR	MICR	ES
92020501	92 0205	8.9	1	1 AR	HURD	PS
92020502	92 0205	8.9	2	2 UN	POLL	UN
92020601	92 0206	8.9	1	1 AR	ANOM	PS
92020602	92 0206	8.9	2	1 AR	LEAN	NB
92020603	92 0206	8.9	3	1 BR	MICR	ES
92020701	92 0207	8.7	1	1 AR	LEAN	NB
92020702	92 0207	8.7	2	1 AR	LEAN	NB
92020703	92 0207	8.7	3	1 BR	MICR	ES
92020704	92 0207	8.7	4	1 UN	INDE	UN
92020801	92 0208	11.2	1	1 PR	OTTO	IV
92021201	92 0212	9.1	1	1 AR	LEAN	NB
92021202	92 0212	9.1	2	1 VA	SHEL	SH
92020901	92 0209	11.4	1	1 AR	LEAN	NB
92021001	92 0210	11.2	1	1 UN	INWO	UN
92021101	92 0211	11.4	1	1 UN	INDE	UN
92021301	92 0213	13.0	1	1 CN	MACK	ES
92021302	92 0213	13.0	2	1 UN	INDE	UN
92021401	92 0214	12.3	1	2 AR	ANOM	PS
92021402	92 0214	12.3	2	1 PO	VAUX	ES
92021403	92 0214	12.3	3	1 UN	POLL	UN
92021501	92 0215	11.2	1	1 AR	HURD	PS
92021601	92 0216	12.2	1	1 AR	LEAN	NB
92021701	92 0217	12.2	1	1 PO	HAMP	ES
92021801	92 0218	13.0	1	1 AR	TUZO	UN
92021802	92 0218	13.0	2	1 AR	SIDN	NB
92021901	92 0219	13.0	1	1 AR	APPF	PS
92022001	92 0220	12.3	1	1 PR	OTTO	IV
92022002	92 0220	12.3	2	1 AR	ANOM	PS
92022003	92 0220	12.3	3	1 VA	SHEL	SH
92022101	92 0221	11.6	1	2 PO	CHAN	ES
92022201	92 0222	12.3	1	1 MO	HAPL	EV
92022202	92 0222	12.3	2	1 VA	SHEL	SH
92022401	92 0224	13.0	1	1 AR	LEAN	NB
92022301	92 0223		1	1 AR	WAPT	NB
92022501	92 0225	LO	1	1 UN	POLL	UN
92022502	92 0225	12.0	2	1 VA	SHEL	SH
92022601	92 0226	11.8	1	1 AR	APPF	PS
92022701	92 0227	12.0	1	1 AR	ISOX	PS
92022801	92 0228	12.5	1	1 AR	LEAN	NB
92022901	92 0229	12.7	1	1 AR	LEAN	NB
92023101	92 0231	8.5	1	1 PO	VAUX	ES
92023102	92 0231	8.5	2	1 PO	CHAN	ES
92023103	92 0231	8.3	3	1 AR	PARK	EV
92023001	92 0230	12.8	1	1 AR	LEAN	NB
92023201	92 0232	11.4	1	1 AR	INAR	UN
92023301	92 0233	8.8	1	3 AR	SIDN	NB
92023302	92 0233	8.8	2	1 PO	VAUX	ES
92023201	92 0232	8.6	1	1 PO	CHAN	ES
92023401	92 0234	12.7	1	1 CN	JELL	PS

RAYMOND_QUARRY

92023402	92 0234	12.7	2	1 MO	HAPL	EV
92023403	92 0234	12.7	3	1 AR	INAR	UN
92023501	92 0235	8.5	1	1 AR	LEAN	NB
92023601	92 0236	8.6	1	1 AR	NARA	EV
92023602	92 0236	8.6	2	1 PO	VAUX	ES
92023701	92 0237	8.7	1	1 AR	SIDN	NB
92023702	92 0237	8.7	2	1 PO	VAUX	ES
92023801	92 0238	8.6	1	1 AR	HURD	PS
92023901	92 0239	11.4	1	2 AR	HURD	PS
92024001	92 0240	8.8	1	1 PR	OTTO	IV
92024101	92 0241	8.5	1	2 PO	CHAN	ES
92024102	92 0241	8.5	2	1 AR	PARK	EV
92024201	92 0242	8.5	1	1 PO	CHAN	ES
92024202	92 0242	8.5	2	4 UN	POLL	UN
92024301	92 0243	8.7	1	3 PO	VAUX	ES
92024302	92 0243	8.7	2	1 AR	OLEN	EV
92024501	92 0245	8.6	1	1 PO	CHAN	ES
92024601	92 0246	8.5	1	1 AR	LEAN	NB
92024901	92 0249	10.1	1	2 AR	WAPT	NB
92024902	92 0249	10.1	2	1 AR	NECT	PS
92024801	92 0248	8.6	1	1 PR	OTTO	IV
92024802	92 0248	8.6	2	3 MO	HAPL	EV
92024701	92 0247	8.6	1	1 AR	KOOT	EV
92025301	92 0253	8.5	1	1 AR	HURD	PS
92025401	92 0254	8.9	1	1 PR	OTTO	IV
92025901	92 0259	10.0	1	7 UN	POLL	UN
92025601	92 0256	8.5	1	1 PO	CHAN	ES
92025602	92 0256	8.5	2	1 AR	PARK	EV
92026201	92 0262	8.7	1	1 AR	SIDN	NB
92026302	92 0263	8.6	1	1 AR	HURD	PS
92026401	92 0264	8.5	1	1 AR	LEAN	NB
92026101	92 0261	8.5	1	1 CN	CAMB	ES
92025801	92 0258	7.9	1	1 AR	ANOM	PS
92026701	92 0267	11.9	1	1 AR	APPF	PS
92027001	92 0270	10.0	1	1 AR	HURD	PS
92026901	92 0269	11.2	1	1 AR	LEAN	NB
92026601	92 0266	11.2	1	2 PR	OTTO	IV
92026501	92 0265	11.8	1	1 AR	SIDN	NB
92027201	92 0272	8.5	1	1 PO	CHAN	ES
92027202	92 0272	8.5	2	1 AR	ALUT	PS
92027203	92 0272	8.5	3	1 AR	ANOM	PS
92027101	92 0271	8.5	1	8 PO	CHAN	ES
92027102	92 0271	8.5	2	4 PO	VAUX	ES
92027103	92 0271	8.5	3	1 PR	OTTO	IV
92027501	92 0275	11.9	1	1 CN	MACK	ES
92027502	92 0275	11.9	2	1 AR	AGNO	PS
92027601	92 0276	13.0	1	1 CN	MACK	ES
92027701	92 0277	12.0	1	1 AR	TUZO	UN
92027801	92 0278	8.0	1	1 AR	SIDN	NB
92028101	92 0281	13.0	1	1 AR	ANOD	PS
92027901	92 0279	10.5	1	2 PR	OTTO	IV

RAYMOND_QUARRY

92027902	92 0279	10.5	2	1 AR	APPF	PS
92027903	92 0279	10.5	3	1 UN	INDE	UN
92028001	92 0280	8.5	1	1 AR	LEAN	NB
92028201	92 0282	8.7	1	1 AR	LEAN	NB
92028202	92 0282	8.7	2	1 AR	INAR	UN
92028601	92 0286	8.5	1	1 AR	LEAN	NB
92028401	92 0284	8.5	1	1 AR	LEAN	NB
92028602	92 0286	8.5	2	1 UN	INDE	UN
92028701	92 0287	7.8	1	2 AR	INAR	UN
92028301	92 0283	8.5	1	1 AR	EMER	EV
92028302	92 0283	8.5	2	1 AR	INAR	UN
92028303	92 0283	8.5	3	2 UN	POLL	UN
92028801	92 0288		1	1 AR	ANOD	PS
92028901	92 0289	NL	1	1 AR	SIDN	NB
92029001	92 0290	10.0	1	1 AR	OLEN	EV
92029002	92 0290	10.0	2	1 AR	SIDN	NB
92029101	92 0291	10.4	1	1 AR	LEAN	NB
92029102	92 0291	10.4	2	1 AR	LEAN	NB
92029103	92 0291	10.4	3	1 AR	SIDN	NB
92029201	92 0292	8.6	1	1 AR	SIDN	NB
92029501	92 0295	9.7	1	1 AR	HURD	PS
92029502	92 0295	9.7	2	1 PO	VAUX	ES
92029503	92 0295	9.7	3	1 AR	LEAN	NB
92029504	92 0295	9.7	4	1 UN	INDE	UN
92029301	92 0293	8.0	1	1 AR	HURD	PS
92029401	92 0294	10.0	1	6 UN	POLL	UN
92029701	92 0297	9.7	1	1 AR	SIDN	NB
92029601	92 0296	10.6	1	1 AL	MARG	AA
92029801	92 0298	10.1	1	1 PR	OTTO	IV
92029901	92 0299	9.8	1	1 AR	LEAN	NB
92030001	91 0300	9.6	1	1 PO	HAMP	ES
92030101	92 0301	8.8	1	1 AR	HURD	PS
92030201	92 0302	9.9	1	1 AR	HURD	PS
92030301	92 0303	12.0	1	1 AR	HURD	PS
92030401	92 0304	9.9	1	1 AR	NECT	PS
92030501	92 0305	10.0	1	1 PR	OTTO	IV
92030601	92 0306	9.8	1	1 AR	APPF	PS
92030801	92 0308	8.5	1	2 PO	CHAN	ES
92030802	92 0308	8.5	2	1 AR	PARK	EV
92030803	92 0308	8.5	3	3 UN	POLL	UN
92030901	92 0309	9.9	1	1 PO	TAKA	ES
92031001	92 0310	10.6	1	1 PO	CHOI	ES
92031201	92 0312	10.6	1	1 AR	ANOM	PS
92031301	92 0313	9.7	1	1 AR	LEAN	NB
92031401	92 0314	7.9	1	1 AR	ANOM	PS
92031501	92 0315	12.0	1	1 AR	TUZO	UN
92031601	92 0316	9.7	1	1 AR	LEAN	NB
92031602	92 0316	9.7	2	2 PR	OTTO	IV
92031603	92 0316	9.7	3	1 PO	VAUX	ES
92031701	92 0317	7.9	1	1 AR	LEAN	NB
92031901	92 0319	10.1	1	1 CN	JELL	PS

RAYMOND_QUARRY

92032001	92 0320	9.8	1	1 UN	INTU	UN
92032201	92 0322	10.8	1	1 AR	LEAN	NB
92032202	92 0322	10.8	2	1 PR	OTTO	IV
92032101	92 0321	10.4	1	1 AR	LEAN	NB
92032301	92 0323	10.1	1	1 AR	LEAN	NB
92031801	92 0318	10.2	1	1 AR	LEAN	NB
92032201	92 0322	10.8	1	1 AR	LEAN	NB
92032401	92 0324	10.5	1	1 AR	LEAN	NB
92032501	92 0325	10.5	1	1 AR	LEAN	NB
92032601	92 0326	9.7	1	1 AR	LEAN	NB
92032701	92 0327	10.4	1	1 AR	APPF	PS
92033001	92 0330	9.7	1	1 PO	CHAN	ES
92033002	92 0330	9.7	2	1 PR	OTTO	IV
92033003	92 0330	9.7	3	1 BR	MICR	ES
92036301	92 0363	11.4	1	2 CN	JELL	PS
92036501	92 0365	10.6	1	1 AR	SIDN	NB
92036601	92 0366	9.7	1	1 AR	TUZO	UN
92036901	92 0369	11.9	1	1 AR	HURD	PS
92036902	92 0369	11.9	2	1 PR	OTTO	IV
92036903	92 0369	11.9	3	1 VA	SHEL	SH
92036701	92 0367	10.2	1	2 PO	TAKA	ES
92036801	92 0368	10.6	1	1 UN	INTU	UN
92036802	92 0368	10.6	2	1 UN	INWO	UN
92037101	92 0371	11.4	1	1 AR	HURD	PS
92037301	92 0373	10.2	1	1 AR	LEAP	NB
92037302	92 0373	10.2	2	1 PO	VAUX	ES
92037001	92 0370	8.2	1	1 AR	SIDN	NB
92037401	92 0374	9.5	1	1 PR	OTTO	IV
92037402	92 0374	9.5	2	1 MO	HAPL	EV
92037501	92 0375	9.7	1	1 PR	OTTO	IV
92037502	92 0375	9.7	2	2 AR	LEAN	NB
92037503	92 0375	9.7	3	1 AR	LEAN	NB
92037504	92 0375	9.7	4	1 AR	WAPT	NB
92037601	92 0376	9.5	1	1 AR	HURD	PS
92037602	92 0376	9.5	2	1 UN	INDE	UN
92032801	92 0328	10.7	1	1 AR	HURD	PS
92037701	92 0377	9.7	1	1 AR	LEAN	NB
92037901	92 0379	10.2	1	1 UN	INDE	UN
92037801	92 0378	9.7	1	1 PR	OTTO	IV
92038001	92 0380	10.4	1	1 AR	LEAN	NB
92038901	92 0389	10.4	1	1 AR	LEAN	NB
92038902	92 0389	10.4	2	1 AR	INAR	UN
92039001	92 0390	10.4	1	1 AR	LEAN	NB
92038801	92 0388	8.6	1	1 AR	ANOD	PS
92038601	92 0386	9.3	1	1 AR	HURD	PS
92038602	92 0386	9.3	2	3 ON	HALL	EV
92039201	92 0392	9.5	1	1 PO	TAKA	ES
92039401	92 0394	10.1	1	1 AR	LEAN	NB
92039501	92 0395	10.2	1	1 UN	INDE	UN
92039601	92 0396	9.5	1	4 PR	OTTO	IV
92039701	92 0397	8.7	1	1 PR	OTTO	IV

RAYMOND_QUARRY

92039801	92 0398	10.0	1	1 PO	VAUX	ES
92039901	92 0399	9.7	1	1 AR	SIDN	NB
92039902	92 0399	9.7	2	1 UN	POLL	UN
92040001	92 0400	10.4	1	1 AR	LEAN	NB
92040201	92 0402	10.3	1	1 AR	LEAN	NB
92040202	92 0402	10.3	2	2 PO	CHAN	ES
92040301	92 0403	8.9	1	1 AR	LEAN	NB
92040401	92 0404	10.4	1	1 AR	LEAN	NB
92040501	92 0405	8.1	1	1 AL	INAL	UN
92040502	92 0405	8.1	2	1 MO	HELC	EV
92040601	92 0406	8.0	1	1 AR	SIDN	NB
92040602	92 0406	8.0	2	1 VA	SHEL	SH
92040701	92 0407	8.5	1	1 PR	OTTO	IV
92040801	92 0408	8.5	1	1 PO	LEPT	ES
92040901	92 0409	9.0	1	1 AR	HURD	PS
92041001	92 0410	11.2	1	2 AR	LEAN	NB
92041101	92 0411	8.5	1	1 AR	TUZO	UN
92041201	92 0412	8.6	1	1 AR	HURD	PS
92041601	92 0416	8.5	1	3 PO	VAUX	ES
92041602	92 0416	8.5	2	32 AN	TUBU	ES
92041603	92 0416	8.5	3	1 HE	CHAN	ES
92041604	92 0416	8.5	4	6 BR	MICR	ES
92041501	92 0415	9.7	1	1 CN	MACK	ES
92041502	92 0415	9.7	2	1 AR	PAGE	PS
92041503	92 0415	9.7	3	2 AR	ALUT	PS
92041401	92 0414	8.4	1	1 AR	SIDN	NB
92041701	92 0417	9.7	1	1 CN	MACK	ES
92041901	92 0419	9.8	1	1 PO	CHOI	ES
92042201	92 0422	9.5	1	1 AR	HURD	PS
92042101	92 0421	9.7	1	1 AR	LEAN	NB
92042301	92 0423	10.4	1	1 AR	HURD	PS
92042302	92 0423	10.4	2	1 PR	OTTO	IV
92042401	92 0424		1	1 AR	HURD	PS
92042501	92 0425	NL	1	1 AR	LEAN	NB
92042801	92 0428	10.2	1	1 AR	TUZO	UN
92042701	92 0427	10.8	1	1 EC	CREE	EV
92042601	92 0426	10.8	1	1 AR	INAR	UN
92043101	92 0431	10.8	1	1 AR	SIDN	NB
92043102	92 0431	10.8	1	1 AR	ALUT	PS
92043201	92 0432	9.5	1	1 AR	APPF	PS
92043001	92 0430	11.6	1	1 AR	HURD	PS
92043301	92 0433	10.0	1	1 AR	HURD	PS
92043401	92 0434	10.5	1	1 AR	LEAN	NB
92043501	92 0435	10.0	1	1 AR	APPF	PS
92043601	92 0436		1	1 PR	OTTO	IV
92043701	92 0437	NL	1	1 PR	OTTO	IV
92043801	92 0438	9.8	1	1 AR	LEAN	NB
92043802	92 0438	9.8	2	1 PO	VAUX	ES
92044001	92 0440	10.5	1	1 CN	JELL	PS
92043901	92 0439	10.3	1	1 CN	JELL	PS
92045401	92 0454	12.5	1	1 AR	LEAN	NB

RAYMOND_QUARRY

92045501	92 0455	9.1	1	1 AR	SIDN	NB
92045601	92 0456	10.8	1	1 AR	LEAN	NB
92045701	92 0457	9.0	1	2 AR	LEAN	NB
92045702	92 0457	9.0	2	1 AR	WAPT	NB
92045801	92 0458	9.0	1	1 AR	SIDN	NB
92045802	92 0458	9.0	2	1 PO	VAUX	ES
92045901	92 0459	9.0	1	1 AR	SIDN	NB
92046101	92 0461	9.0	1	1 AR	LEAN	NB
92046201	92 0462	9.1	1	1 AR	SIDN	NB
92046202	92 0462	9.1	2	4 UN	POLL	UN
92046401	92 0464	10.9	1	1 AR	LEAN	NB
92046402	92 0464	10.9	2	1 AR	PAGE	PS
92046301	92 0463	8.8	1	1 AR	LEAN	NB
92046601	92 0466	8.8	1	2 PO	CHOI	ES
92046501	92 0465	8.8	1	1 AR	SIDN	NB
92046801	92 0468	8.8	1	1 AR	LEAN	NB
92046901	92 0469	10.8	1	1 AR	HURD	PS
92047001	92 0470	9.9	1	1 AR	ANOM	PS
92047002	92 0470	9.9	2	1 AR	WAPT	NB
92047101	92 0471	10.5	1	1 CN	JELL	PS
92047102	92 0471	10.5	2	1 AR	LEAN	NB
92047201	92 0472	10.9	1	1 PO	TAKA	ES
92047301	92 0473	10.7	1	1 AR	HURD	PS
92047401	92 0474	8.4	1	1 CN	JELL	PS
92047402	92 0474	8.4	2	1 AR	HURD	PS
92047403	92 0474	8.4	3	2 PR	OTTO	IV
92047501	92 0475	11.4	1	1 AR	SIDN	NB
92047601	92 0476	10.6	1	1 AR	ISOX	PS
92047701	92 0477	8.5	1	1 AR	WAPT	NB
92047801	92 0478	8.8	1	1 AR	LEAN	NB
92047901	92 0479	8.5	1	1 AR	LEAN	NB
92048001	92 0480	8.7	1	3 PO	CHOI	ES
92048201	92 0482	8.5	1	1 AR	LEAN	NB
92048401	92 0484	11.0	1	1 PR	OTTO	IV
92048501	92 0485	10.9	1	1 AR	LEAN	NB
92048301	92 0483	10.9	1	1 AR	LEAN	NB
92048601	92 0486	8.4	1	1 AR	ANOM	PS
92048701	92 0487	10.5	1	1 AR	APPF	PS
92048801	92 0488	10.9	1	1 AR	LEAN	NB
92049001	92 0490	10.0	1	1 CN	JELL	PS
92049101	92 0491	10.4	1	1 PR	OTTO	IV
92049201	92 0492	10.0	1	1 AR	WAPT	NB
92049301	92 0493	9.8	1	2 PR	OTTO	IV
92049302	92 0493	9.8	2	1 AR	LEAN	NB
92049401	92 0494	10.7	1	1 AR	SIDN	NB
92049501	92 0495	8.5	1	1 AR	ANOM	PS
92049701	92 0497	10.0	1	1 AR	HURD	PS
92049801	92 0498	8.5	1	1 PO	VAUX	ES
92049802	92 0498	8.5	2	1 AR	SIDN	NB
92049803	92 0498	8.5	3	1 AR	HURD	PS
92049901	92 0499	10.5	1	1 AR	LEAN	NB

RAYMOND_QUARRY

92050001	92 0500	9.8	1	1 PO	TAKA	ES
92050101	92 0501	10.7	1	1 AR	ANOD	PS
92050201	92 0502	10.0	1	1 AR	LEAN	NB
92050202	92 0502	10.0	2	1 UN	INDE	UN
92050301	92 0503	10.0	1	1 AR	LEAN	NB
92050601	92 0506	9.0	1	1 AR	LEAN	NB
92050701	92 0507	9.1	1	1 AR	APPF	PS
92050702	92 0507	9.1	2	1 PO	VAUX	ES
92050801	92 0508	10.7	1	1 AR	HURD	PS
92050901	92 0509	11.4	1	1 AR	HURD	PS
92051001	92 0510	10.9	1	1 AR	HURD	PS
92051101	92 0511	9.2	1	2 AR	LEAN	NB
92051102	92 0511	9.2	2	1 PR	OTTO	IV
92051201	92 0512	10.4	1	1 CN	JELL	PS
92051202	92 0512	10.4	2	3 MO	HAPL	EV
92051301	92 0513	10.2	1	1 AR	INAR	UN
92051401	92 0514	11.4	1	1 AR	INAR	UN
92051501	92 0515	10.8	1	1 AR	WAPT	NB
92051601	92 0516	9.8	1	3 ON	HALL	EV
92051602	92 0516	9.8	2	1 AR	ISOX	PS
92051701	92 0517	8.4	1	1 PO	CHAN	ES
92051702	92 0517	8.4	2	1 AR	PARK	EV
92051901	92 0519	8.5	1	127 PO	CHOI	ES
92051801	92 0518	14.5	1	1 UN	INDE	UN
92052001	92 0520	10.8	1	1 AR	ANOD	PS
92052101	92 0521	10.8	1	1 AR	HURD	PS
92052201	92 0522	14.0	1	2 AR	OLEN	EV
92052202	92 0522	14.0	2	1 AR	SHEL	SH
92052301	92 0523	9.9	1	1 AR	LEAN	NB
92052501	92 0525	10.0	1	1 AR	LEAN	NB
92052502	92 0525	10.0	2	1 PO	VAUX	ES
92052601	92 0526	10.0	1	1 AR	LEAN	NB
92052401	92 0524	10.2	1	1 AR	INAR	UN
92052402	92 0524	10.2	2	1 UN	POLL	UN
92052701	92 0527	13.2	1	1 AR	APPF	PS
92052801	92 0528	10.0	1	1 PR	OTTO	IV
92052901	92 0529	13.0	1	1 AR	HURD	PS
92053401	92 0534	10.5	1	1 PO	VAUX	ES
92053301	92 0533	10.9	1	1 AR	LEAN	NB
92053101	92 0531	11.6	1	1 MO	HAPL	EV
92053501	92 0535	11.5	1	1 MO	HAPL	EV
92053701	92 0537	11.0	1	1 AR	LEAN	NB
92054101	92 0541	10.2	1	1 PR	OTTO	IV
92054102	92 0541	10.2	2	1 UN	POLL	UN
92054201	92 0542	10.9	1	1 AR	SIDN	NB
92054301	92 0543	10.0	1	1 PO	TAKA	ES
92054401	92 0544	10.9	1	1 AR	LEAN	NB
92054501	92 0545	12.5	1	1 UN	INDE	UN
92054601	92 0546	11.0	1	1 PO	TAKA	ES
92054701	92 0547	10.6	1	1 AR	LEAN	NB
92054801	92 0548	10.8	1	1 AR	ISOX	PS

RAYMOND_QUARRY

92054901	92 0549	10.8	1	1 AR	SIDN	NB
92055101	92 0551	8.8	1	1 AR	SIDN	NB
92052201	92 0522	8.6	1	1 AR	SIDN	NB
92055301	92 0553	12.0	1	1 AR	LEAN	NB
92054401	92 0544	12.4	1	1 AR	APPF	PS
92055501	92 0555	10.4	1	1 AR	LEAN	NB
92055601	92 0556	12.5	1	1 AR	LEAN	NB
92055701	92 0557	12.5	1	1 AR	HURD	PS
92055801	92 0558	11.2	1	1 AR	LEAN	NB
92055802	92 0558	11.2	2	1 PR	OTTO	IV
92055901	92 0559	10.8	1	1 PO	TAKA	ES
92056001	92 0560	12.0	1	1 BR	MICR	ES
92056101	92 0561	10.0	1	1 AR	LEAN	NB
92056201	92 0562	12.2	1	1 MO	HAPL	EV
92056202	92 0562	12.2	2	1 VA	SHEL	SH
92056301	92 0563	11.2	1	1 AR	LEAN	NB
92056401	92 0564	12.2	1	1 AR	PARK	EV
92056501	92 0565	12.4	1	1 AR	HURD	PS
92056601	92 0566	10.6	1	1 AR	LEAN	NB
92056701	92 0567	10.4	1	1 MO	HAPL	EV
92056702	92 0567	10.4	2	1 AR	LEAN	NB
92056801	92 0568	12.4	1	1 AR	SIDN	NB
92056802	92 0568	12.4	2	1 UN	INDE	UN
92056901	92 0569	10.6	1	1 AR	LEAN	NB
92057001	92 0570	11.2	1	1 AR	LEAN	NB
92057101	92 0571	9.9	1	2 AR	LEAN	NB
92057201	92 0572	11.2	1	1 PR	OTTO	IV
92057202	92 0572	11.2	2	1 AR	HURD	PS
92057301	92 0573	9.3	1	1 AR	LEAP	NB
92057501	92 0575	10.5	1	1 AR	ANOD	PS
92057601	92 0576	9.4	1	1 AR	APPF	PS
92057801	92 0578	10.5	1	1 UN	INDE	UN
92057701	92 0577	10.5	1	1 AR	INAR	UN
92057901	92 0579	9.0	1	1 AR	SIDN	NB
92058001	92 0580	9.0	1	1 AR	INAR	UN
92058101	92 0581	10.5	1	1 PO	CHOI	ES
92060401	92 0604	10.7	1	1 AR	ANOM	PS
92060501	92 0605	10.5	1	1 AR	LEAN	NB
92060601	92 0606	10.5	1	1 AR	LEAN	NB
92060801	92 0608	9.4	1	9 PO	TAKA	ES
92060901	92 0609	9.5	1	1 PO	TAKA	ES
92061001	92 0610	9.3	1	1 AR	LEAP	NB
92061101	92 0611	9.6	1	1 PR	OTTO	IV
92061102	92 0611	9.6	2	1 AR	LEAN	NB
92061103	92 0611	9.6	3	5 UN	POLL	UN
92061201	92 0612	10.5	1	1 AR	LEAN	NB
92061301	92 0613	10.4	1	1 AR	SIDN	NB
92061401	92 0614	9.6	1	1 AR	SIDN	NB
92061701	92 0617	10.4	1	1 AR	ANOD	PS
92061601	92 0616	11.0	1	1 AR	LEAN	NB
92061901	92 0619	10.7	1	1 AR	APPF	PS

RAYMOND_QUARRY

92061902	92 0619	10.7	2	2 PR	OTTO	IV
92061903	92 0619	10.7	1	1 AR	SIDN	NB
92061904	92 0619	10.7	3	2 AR	LEAN	NB
92062001	92 0620	10.4	1	1 AR	LEAN	NB
92062401	92 0624	10.9	1	1 PR	OTTO	IV
92062801	92 0628	10.4	1	1 AR	SIDN	NB
92062901	92 0629	9.6	1	2 AR	LEAN	NB
92062501	92 0625	10.6	1	1 AR	LEAN	NB
92063001	92 0630	10.8	1	1 AR	LEAN	NB
92063101	92 0631	10.6	1	1 AR	LEAN	NB
92063201	92 0632	11.0	1	1 PR	OTTO	IV
92065701	92 0657	10.4	1	1 AR	HURD	PS
92065601	92 0656	9.0	1	6 PR	OTTO	IV
92065901	92 0659	10.4	1	1 UN	INDE	UN
92065801	92 0658	10.2	1	1 AR	LEAN	NB
92066101	92 0661	10.3	1	1 AR	LEAN	NB
92066102	92 0661	10.3	2	1 PR	OTTO	IV
92066001	92 0660	11.4	1	2 CN	JELL	PS
92066002	92 0660	11.4	2	1 AR	PAGE	PS
92066201	92 0662	10.8	1	1 PR	OTTO	IV
92066301	92 0663	10.2	1	1 AR	ANOD	PS
92066401	92 0664	10.5	1	3 AR	LEAN	NB
92066402	92 0664	10.5	2	1 PR	OTTO	IV
92066501	92 0665	10.4	1	1 AR	SIDN	NB
92066601	92 0666	10.4	1	1 AR	LEAN	NB
92066701	92 0667	10.4	1	1 PO	VAUX	ES
92066702	92 0667	10.4	2	1 AR	LEAN	NB
92066801	92 0668	10.8	1	1 AR	SIDN	NB
92066901	92 0669	9.4	1	1 AR	APPF	PS
92067001	92 0670	10.8	1	1 PR	OTTO	IV
92070301	92 0703	9.2	1	2 CN	MACK	ES
92070302	92 0703	9.2	2	1 PO	VAUX	ES
92070401	92 0704	10.2	1	1 AR	LEAN	NB
92070402	92 0704	10.2	2	1 AR	ALUT	PS
92070501	92 0705	11.0	1	1 AR	LEAN	NB
92070502	92 0705	11.0	2	1 PR	OTTO	IV
92070701	92 0707	12.4	1	1 AR	LEAN	NB
92070801	92 0708	8.8	1	1 AR	SIDN	NB
92070802	92 0708	8.8	2	2 PO	VAUX	ES
92070803	92 0708	8.8	3	1 BR	NISU	ES
92071101	92 0711	10.8	1	1 AR	LEAN	NB
92070601	92 0706	8.8	1	1 AR	LEAN	NB
92071201	92 0712	10.7	1	1 AR	LEAN	NB
92071301	92 0713	9.6	1	1 AR	APPF	PS
92071401	92 0714	11.0	1	1 PR	OTTO	IV
92071402	92 0714	11.0	2	1 AR	LEAN	NB
92071501	92 0715	8.8	1	1 AR	LEAN	NB
92071601	92 0716	11.0	1	1 AR	TUZO	UN
92071701	92 0717	10.1	1	2 AR	LEAN	NB
92071801	92 0718	10.4	1	1 CN	JELL	PS
92071901	92 0719	10.9	1	1 AR	LEAN	NB

RAYMOND_QUARRY

92072401	92 0724	11.0	1	2 AR	ANOM	PS
92072402	92 0724	11.0	2	1 AR	LEAN	NB
92072403	92 0724	11.0	3	4 PR	OTTO	IV
92071902	92 0719	10.9	2	1 PO	VAUX	ES
92072501	92 0725	9.6	1	2 PO	CHAN	ES
92072502	92 0725	9.6	2	2 PO	VAUX	ES
92072503	92 0725	9.6	3	1 AR	SIDN	NB
92072504	92 0725	9.6	4	1 UN	INDE	UN
92072601	92 0726	10.9	1	1 AR	SIDN	NB
92072602	92 0726	10.9	2	1 AR	LEAN	NB
92072801	92 0728	10.9	1	10 UN	INDE	UN
92072901	92 0729	10.9	1	1 AR	LEAN	NB
92072902	92 0729	10.9	2	1 UN	INDE	UN
92073001	92 0730	10.4	1	1 AR	INAR	UN
92073101	92 0731	10.3	1	1 AR	LEAN	NB
92073201	92 0732	9.6	1	1 AR	LEAN	NB
92073301	92 0733	10.3	1	1 PR	OTTO	IV
92073401	92 0734	11.0	1	1 AR	LEAN	NB
92073501	92 0735	9.6	1	1 CN	MACK	ES
92073901	92 0739	10.4	1	1 PO	CHOI	ES
92073902	92 0739	10.4	2	1 PO	HAZE	ES
92073903	92 0739	10.4	3	1 VA	SHEL	SH
92073801	92 0738	10.5	1	1 AR	APPF	PS
92074001	92 0740	10.8	1	1 AR	LEAN	NB
92073601	92 0736	10.4	1	1 AR	LEAP	NB
92073701	92 0737	10.4	1	1 AR	LEAN	NB
92073702	92 0737	10.4	2	1 PR	OTTO	IV
92074101	92 0741	10.3	1	1 AR	LEAN	NB
92074201	92 0742	10.4	1	2 AR	LEAN	NB
92074202	92 0742	10.4	2	3 PR	OTTO	IV
92074203	92 0742	10.4	3	1 AR	ANOM	PS
92076001	92 0760	10.9	1	1 AR	ANOD	PS
92076101	92 0761	11.0	1	1 AR	LEAN	NB
92076201	92 0762	10.9	1	1 MO	HAPL	EV
92075901	92 0759	11.0	1	1 AR	LEAN	NB
92076301	92 0763	11.1	1	1 AR	ANOM	PS
92076401	92 0764	10.8	1	1 AR	HURD	PS
92076501	92 0765	11.0	1	3 AR	ISOX	PS
92076502	92 0765	11.0	2	4 AN	TUBU	ES
92076503	92 0765	11.0	3	15 HE	ALUT	PS
92076601	92 0766	11.5	1	1 AR	ISOX	PS
92076701	92 0767	11.0	1	1 UN	INDE	UN
92076901	92 0769	11.0	1	1 AR	LEAN	NB
92077001	92 0770	10.2	1	1 AR	SIDN	NB
92077101	92 0771	11.0	1	1 AR	LEAN	NB
92077201	92 0772	10.9	1	1 AR	TUZO	UN
92077301	92 0773	11.0	1	1 PR	OTTO	IV
92077401	92 0774	10.2	1	1 AR	SIDN	NB
92077501	92 0775	11.0	1	1 AR	SIDN	NB
92077601	92 0776	11.2	1	2 CN	JELL	PS
92077701	92 0777	11.4	1	1 AR	TUZO	UN

RAYMOND_QUARRY

92077801	92 0778	10.1	1	2 AR	LEAN	NB
92077901	92 0779	10.1	1	1 AR	LEAN	NB
92078001	92 0780	11.0	1	1 CN	JELL	PS
92078201	92 0782	10.4	1	1 AR	LEAN	NB
92078301	92 0783	10.6	1	1 AR	LEAN	NB
92078302	92 0783	10.6	2	1 AR	LEAN	NB
92078303	92 0783	10.6	3	1 AR	WAPT	NB
92078401	92 0784	10.5	1	1 AR	APPF	PS
92078501	92 0785	11.0	1	1 AR	LEAN	NB
92078601	92 0786	11.0	1	1 AR	APPF	PS
92078701	92 0787	10.7	1	1 AR	ANOM	PS
92078801	92 0788	9.6	1	2 PO	VAUX	ES
92078802	92 0788	9.6	2	1 PO	CHAN	ES
92078803	92 0788	9.6	3	1 AR	SIDN	NB
92079801	92 0798	10.5	1	1 AR	LEAN	NB
92079901	92 0799	9.5	1	1 UN	INDE	UN
92080101	92 0801	10.8	1	1 AR	ANOM	PS
92080201	92 0802	10.7	1	1 AR	INAR	UN
92080301	92 0803	10.0	1	1 AR	LEAN	NB
92080401	92 0804	10.4	1	1 AR	LEAN	NB
92080501	92 0805	10.6	1	1 AR	ANOD	PS
92080601	92 0806	10.5	1	1 AR	SIDN	NB
92080701	92 0807	10.5	1	1 CN	JELL	PS
92080801	92 0808	10.5	1	1 CN	JELL	PS
92081001	92 0810	10.5	1	1 AR	SIDN	NB
92081101	92 0811	10.9	1	2 AR	LEAN	NB
92081102	92 0811	10.9	2	1 AR	TUZO	UN
92081201	92 0812	10.5	1	1 CN	JELL	PS
92081202	92 0812	10.5	2	1 AR	ALUT	PS
92081301	92 0813	10.5	1	1 CN	JELL	PS
92081401	92 0814	8.8	1	4 AR	LEAN	NB
92081601	92 0816	10.5	1	1 AR	LEAN	NB
92081501	92 0815	10.5	1	1 CN	JELL	PS
92081502	92 0815	10.5	2	2 AR	ALUT	PS
92081801	92 0818	10.5	1	1 AR	LEAN	NB
92081901	92 0819	10.6	1	1 AR	HURD	PS
92082201	92 0822	10.5	1	1 PO	HAZE	ES
92082301	92 0823	10.4	1	1 PR	OTTO	IV
92082601	92 0826	10.2	1	1 PR	OTTO	IV
92082602	92 0826	10.2	2	1 AR	LEAN	NB
92082801	92 0828	10.3	1	1 AR	SIDN	NB
92082901	92 0829	11.3	1	1 AR	HURD	PS
92083101	92 0831	10.8	1	17 PR	OTTO	IV
92083201	92 0832	10.8	1	10 PR	OTTO	IV
92083401	92 0834	10.4	1	1 AR	SIDN	NB
92083501	92 0835	10.3	1	1 CN	JELL	PS
92083502	92 0835	10.3	2	1 AR	ALUT	PS
92083503	92 0835	10.3	3	1 PO	CHAN	ES
92083601	92 0836	12.0	1	1 AR	ANOM	PS
92083701	92 0837	10.5	1	1 AR	ANOM	PS
92083801	92 0838	10.4	1	1 AR	LEAN	NB

RAYMOND_QUARRY

92083802	92 0838	10.4	2	1 AR	ORYC	EV
92083901	92 0839	11.0	1	1 AR	LEAN	NB
92083902	92 0839	11.0	2	1 AR	INAR	UN
92084001	92 0840	10.3	1	1 AR	ANOD	PS
92084101	92 0841	10.5	1	1 AR	APPF	PS
92084201	92 0842	10.5	1	1 AR	LEAN	NB
92084301	92 0843	10.3	1	1 CN	JELL	PS
92084302	92 0843	10.3	2	2 PR	OTTO	IV
92084401	92 0844	11.5	1	1 PO	VAUX	ES
92084501	92 0845	11.1	1	1 AR	LEAN	NB
92084601	92 0846	11.1	1	2 AR	LEAN	NB
92084701	92 0847	9.0	1	1 PO	CHOI	ES
92084801	92 0848	9.4	1	1 AR	LEAN	NB
92084901	92 0849	10.5	1	1 AR	WAPT	NB
92085001	92 0850	11.1	1	1 AR	LEAN	NB
92085101	92 0851	10.9	1	1 AR	ANOD	PS
92085201	92 0852	10.5	1	1 AR	ANOM	PS
92085301	92 0853	10.0	1	1 AR	LEAN	NB
92085401	92 0854	10.5	1	1 AR	SIDN	NB
92085501	92 0855	11.1	1	1 AR	LEAN	NB
92085601	92 0856	11.0	1	1 AR	LEAN	NB
92085701	92 0857	10.9	1	1 CN	JELL	PS
92085801	92 0858	11.0	1	1 AR	LEAN	NB
92085901	92 0859	10.6	1	16 PR	OTTO	IV
92086001	92 0860	10.0	1	1 AR	HURD	PS
92086002	92 0860	10.0	2	1 AR	TUZO	UN
92086003	92 0860	10.0	3	1 AR	INAR	UN
92086004	92 0860	10.0	4	1 PO	VAUX	ES
92086101	92 0861	10.2	1	3 PR	OTTO	IV
92086401	92 0864	11.5	1	1 CN	MACK	ES
92086501	92 0865	10.9	1	1 AR	LEAN	NB
92086701	92 0867	9.8	1	1 AR	LEAP	NB
92086801	92 0868	10.9	1	1 UN	INDE	UN
92086802	92 0868	10.9	2	1 PO	VAUX	ES
92086901	92 0869	10.9	1	1 PR	OTTO	IV
92087001	92 0870	11.0	1	1 AR	LEAN	NB
92088601	92 0886	9.5	1	2 AR	ANOM	PS
92088701	92 0887	10.9	1	1 PR	OTTO	IV
92088801	92 0888	11.0	1	1 AR	APPF	PS
92088901	92 0889	10.8	1	3 PO	TAKA	ES
92089001	92 0890	10.6	1	2 PR	OTTO	IV
92089002	92 0890	10.6	2	2 AR	ALUT	PS
92089101	92 0891	10.9	1	1 AR	LEAN	NB
92089201	92 0892	11.4	1	1 AR	SIDN	NB
92089202	92 0892	11.4	2	6 AR	ALUT	PS
92089401	92 0894	10.2	1	1 AR	LEAN	NB
92089501	92 0895	10.3	1	1 AR	SIDN	NB
92089601	92 0896	10.5	1	1 AR	APPF	PS
92089701	92 0897	10.3	1	1 CN	JELL	PS
92089602	92 0896	10.5	2	1 AR	PAGE	PS
92089801	92 0898	10.0	1	1 PO	CHAN	ES

RAYMOND_QUARRY

92089901	92 0899	9.6	1	2 PO	VAUX	ES
92090001	92 0900	10.6	1	1 AR	SIDN	NB
92090101	92 0901	11.1	1	1 AR	LEAN	NB
92090301	92 0903	9.5	1	1 AR	ISOX	PS
92090401	92 0904	9.5	1	1 AR	LEAP	NB
92090501	92 0905	10.4	1	1 PR	OTTO	IV
92090601	92 0906	10.4	1	1 AR	TUZO	UN
92090701	92 0907		1	1 AR	OLEN	EV
92090901	92 0909	NL	1	1 AR	LEAN	NB
92090902	92 0909	NL	2	1 AR	LEAN	NB
92091001	92 0910	NL	1	1 AR	LEAN	NB
92091101	92 0911	11.5	1	1 AR	TUZO	UN
92091201	92 0912	9.6	1	1 CN	MACK	ES
92091202	92 0912	9.6	2	2 CN	MACK	ES
92091301	92 0913	10.8	1	1 CN	JELL	PS
92091401	92 0914	10.2	1	1 AR	HURD	PS
92091402	92 0914	10.2	2	8 AR	PAGE	PS
92091501	92 0915	10.2	1	1 AR	HURD	PS
92091901	92 0919	9.8	1	1 AR	SIDN	NB
92092001	92 0920	10.2	1	1 PR	OTTO	IV
92092201	92 0922	10.2	1	1 AR	LEAN	NB
92092301	92 0923	10.1	1	1 AR	TUZO	UN
92092302	92 0923	10.1	2	1 VA	SHEL	SH
92092401	92 0924	10.1	1	1 AR	LEAN	NB
92092501	92 0925	10.1	1	1 AR	LEAN	NB
92092601	92 0926	9.1	1	1 AR	SIDN	NB
92092602	92 0926	9.1	2	3 UN	POLL	UN
92092701	92 0927	10.1	1	1 PO	CHAN	ES
92092801	92 0928	11.4	1	1 AR	LEAN	NB
92092901	92 0929	10.0	1	1 PR	OTTO	IV
92093001	92 0930	10.1	1	1 AR	LEAN	NB
92093002	92 930	10.1	2	1 PR	OTTO	IV
92093101	92 0930	10.6	1	1 AR	HURD	PS
92093201	92 0932	9.3	1	1 CN	MACK	ES
92093301	92 0933	10.0	1	1 AR	SIDN	NB
92093401	92 0934	9.6	1	1 AR	SIDN	NB
92093402	92 0934	9.6	2	4 PR	OTTO	IV
92093501	92 0935	10.0	1	1 AR	SIDN	NB
92093901	92 0939	10.4	1	1 AR	HURD	PS
92093601	92 0936	10.1	1	1 AR	SIDN	NB
92093801	92 0938	10.1	1	1 AR	LEAN	NB
92093701	92 0937	10.0	1	1 AR	LEAN	NB
92093702	92 0937	10.0	2	1 PO	VAUX	ES
92093703	92 0937	10.0	3	5 UN	POLL	UN
92093704	92 0937	10.0	4	1 UN	INDE	UN
92094001	92 0940	10.0	1	1 AR	LEAN	NB
92094002	92 0940	10.0	2	1 AR	LEAN	NB
92094003	92 0940	10.0	3	1 PR	OTTO	IV
92094101	92 0941	11.2	1	1 AR	INAR	UN
92094201	92 0942	9.5	1	1 AR	HURD	PS
92094301	92 0943	11.1	1	1 PR	OTTO	IV

RAYMOND_QUARRY

92094501	92 0945	10.1	1	7 PO	TAKA	ES
92094601	92 0946	10.0	1	1 AR	OLEN	EV
92094701	92 0947	11.1	1	1 AR	LEAN	NB
92094702	92 0947	11.1	2	1 PR	OTTO	IV
92094401	92 0944	10.1	1	3 PR	OTTO	IV
92094402	92 0944	10.1	2	1 CN	JELL	PS
92094402	92 0944	10.1	2	1 AR	OLEN	EV
92094403	92 0944	10.1	3	1 MO	HAPL	EV
92094404	92 0944	10.1	4	1 AR	LEAN	NB
92094405	92 0948	8.4	5	1 AR	LEAN	NB
92095001	92 0950	10.3	1	1 AR	LEAN	NB
92095601	92 0956	8.3	1	1 AR	LEAN	NB
92095701	92 0957	9.5	1	2 PO	CHAN	ES
92095702	92 0957	9.5	2	1 PO	VAUX	ES
92095801	92 0958	9.8	1	1 PR	OTTO	IV
92095901	92 0959	10.0	1	1 AR	LEAN	NB
92096001	92 0960	9.9	1	1 AR	ODAR	PS
92096101	92 0961	9.9	1	1 AR	ANOM	PS
92096201	92 0962	8.0	1	1 AR	LEAN	NB
92096301	92 0963	9.7	1	1 AR	LEAN	NB
92096302	92 0963	9.7	2	1 PR	OTTO	IV
92096401	92 0964	9.6	1	1 AR	ISOX	PS
92096501	92 0965	9.6	1	1 AR	APPF	PS
92096601	92 0966	9.7	1	1 AR	HURD	PS
92096602	92 0966	9.7	2	1 PO	VAUX	ES
92096701	92 0967	9.2	1	1 AR	TUZO	UN
92097101	92 0971	9.1	1	1 AR	ANOM	PS
92097201	92 0972	9.6	1	1 AR	WAPT	NB
92097301	92 0973	9.7	1	1 AR	HURD	PS
92097401	92 0974	12.1	1	1 AR	TUZO	UN
92097501	92 0975	8.0	1	1 AR	LEAN	NB
92097801	92 0978	10.8	1	1 AR	LEAN	NB
92097901	92 0979	9.4	1	1 AR	LEAN	NB
92098001	92 0980	9.7	1	1 AR	HURD	PS
92098002	92 0980	9.7	2	1 UN	POLL	UN
92098101	92 0981	10.5	1	1 AR	KOOT	EV
92098201	92 0982	8.3	1	1 AR	HURD	PS
92098202	92 0982	8.3	2	3 EC	CREE	EV
92098203	92 0982	8.3	3	1 PO	VAUX	ES
92098401	92 0984	8.4	1	1 AR	LEAN	NB
92098402	92 0984	8.4	2	1 PR	OTTO	IV
92098501	92 0985	8.4	1	1 AR	LEAN	NB
92098502	92 0985	8.4	2	1 PR	OTTO	IV
92098503	92 0985	8.4	3	1 VA	SHEL	SH
92098601	92 0986	10.3	1	1 AR	LEAN	NB
92098602	92 0986	10.3	2	1 PR	OTTO	IV
92098701	92 0987	10.3	1	1 AR	LEAN	NB
92098801	92 0988	8.3	1	1 AR	LEAN	NB
92098901	92 0989	10.3	1	1 AR	LEAN	NB
92098902	92 0989	10.3	2	1 AR	OLEN	EV
92099101	92 0991	10.8	1	1 AR	APPF	PS

RAYMOND_QUARRY

92092201	92 0992	10.0	1	1 AR	LEAN	NB
92099401	92 0994	10.7	1	2 BR	MICR	ES
92100101	92 1001	10.3	1	1 AR	LEAN	NB
92100102	92 1001	10.3	2	1 PR	OTTO	IV
92100201	92 1002	10.5	1	1 AR	LEAN	NB
92100601	92 1006	10.5	1	2 PO	VAUX	ES
92100801	92 1008	10.6	1	1 AR	HURD	PS
92100901	92 1009	10.8	1	1 AR	INAR	UN
92101001	92 1010	9.8	1	1 AR	LEAN	NB
92101101	92 1011	9.8	1	1 AR	LEAN	NB
92101102	92 1011	9.8	2	1 PO	CHAN	ES
92101103	92 1011	9.8	3	1 PO	VAUX	ES
92101104	92 1011	9.8	4	1 AL	INAL	UN
92101301	92 1013	10.5	1	1 CN	JELL	PS
92101401	92 1014	10.5	1	1 PR	OTTO	IV
92101501	92 1015	9.0	1	1 UN	INDE	UN
92101601	92 1016	9.8	1	1 AR	LEAN	NB
9.2E+08	92 1017	9.8	1	1 PO	CHAN	ES
92101701	92 1018	10.2	1	1 AR	LEAN	NB
92101802	92 1018	10.2	2	4 UN	POLL	UN
92101803	92 1018	10.2	3	1 PR	OTTO	IV
92101901	92 1019	10.8	1	1 AR	LEAN	NB
92102101	92 1021	10.1	1	1 AR	LEAN	NB
92102102	92 1021	10.1	2	1 AR	LEAN	NB
92102201	92 1022	10.0	1	1 CN	MACK	ES
92102301	92 1023	10.0	1	1 AR	APPF	PS
92102401	92 1024	10.5	1	1 AR	LEAN	NB
92102501	92 1025	10.7	1	1 AR	LEAN	NB
92102502	92 1025	10.7	2	1 UN	INDE	UN
9.2E+08	92 1026	10.5	1	1 AR	LEAN	NB
92102601	92 1028	10.6	1	1 AR	LEAN	NB
92102901	92 1029	9.0	1	1 AR	SIDN	NB
92102902	92 1029	9.0	2	1 PO	VAUX	ES
92102903	92 1029	9.0	3	1 AR	LEAN	NB
92103001	92 1030	10.8	1	1 AR	LEAN	NB
92103101	92 1031	10.1	1	1 AR	ANOM	PS
92103301	92 1033	11.7	1	1 AR	TUZO	UN
92103401	92 1034	8.4	1	1 AR	SIDN	NB
92103501	92 1035	8.4	1	1 PO	CHOI	ES
92103601	92 1036	11.2	1	1 AR	SIDN	NB
92104201	92 1042	9.0	1	1 AR	APPF	PS
92104202	92 1042	9.0	2	2 UN	POLL	UN
92104501	92 1045	8.4	1	1 AR	SIDN	NB
92104401	92 1044	9.0	1	1 AR	SIDN	NB
92104402	92 1044	9.0	2	5 UN	POLL	UN
92104601	92 1046	8.4	1	1 AR	LEAP	NB
92104701	92 1047	9.3	1	1 AR	LEAN	NB
92104801	92 1048	10.0	1	1 AR	LEAN	NB
92104901	92 1049	8.4	1	1 AR	LEAP	NB
92105101	92 1051	10.0	1	1 AR	HURD	PS
92105201	92 1052	9.5	1	1 AR	ANOD	PS

RAYMOND_QUARRY

92105401	92 1054	10.4	1	2 AR	ISOX	PS
92105301	92 1053	10.0	1	1 AR	LEAN	NB
92105501	92 1055	8.4	1	1 AR	LEAN	NB
92105502	92 1055	8.4	2	1 AR	LEAN	NB
92105601	92 1056	8.5	1	1 AR	SIDN	NB
92105602	92 1056	8.5	2	1 PO	CHOI	ES
92105701	92 1057	9.5	1	1 AR	WAPT	NB
92105801	92 1058	9.5	1	1 PR	OTTO	IV
92106001	92 1060	10.6	1	1 AR	APPF	PS
92106101	92 1061	8.4	1	1 AR	LEAN	NB
92106201	92 1062	9.9	1	1 PO	VAUX	ES
92106202	92 1062	9.9	2	1 AR	LEAN	NB
92106301	92 1063	8.4	1	1 AR	LEAP	NB
92106401	92 1064	8.4	1	1 UN	POLL	UN
92106501	92 1065	8.4	1	1 UN	INDE	UN
92106601	92 1066	8.2	1	16 PO	CHOI	ES
92106602	92 1066	8.2	2	1 PO	VAUX	ES
92106701	92 1067	8.4	1	1 AR	LEAN	NB
92107001	92 1070	9.3	1	1 AR	LEAN	NB
92107101	92 1071	9.8	1	1 AR	LEAN	NB
92107201	92 1072	9.8	1	1 AR	LEAN	NB
92107301	92 1073	9.3	1	1 AR	LEAN	NB
92107401	92 1074	8.2	1	1 AR	ISOX	PS
92107901	92 1079	9.2	1	1 PR	OTTO	IV
92108101	92 1081	9.2	1	4 PO	TAKA	ES
92108401	92 1084	11.2	1	1 AR	LEAN	NB
92108402	92 1084	11.2	2	3 PR	OTTO	IV
92108403	92 1084	11.2	3	1 CN	MACK	ES
92108404	92 1084	11.2	4	3 UN	POLL	UN
92108001	92 1080	9.4	1	1 AR	ISOX	PS
92108501	92 1085	8.0	1	1 AR	SIDN	NB
92108701	92 1087	10.4	1	1 AR	LEAN	NB
92108801	92 1088	10.6	1	1 PO	VAUX	ES
92108901	92 1089	11.0	1	1 AR	LEAN	NB
92109101	92 1091	11.0	1	3 PR	OTTO	IV
92109102	92 1091	11.0	2	1 AR	LEAN	NB
92109301	92 1093	10.3	1	1 AR	LEAP	NB
92109201	92 1092	7.8	1	1 AR	HURD	PS
92109202	92 1092	7.8	2	3 UN	POLL	UN
92109401	92 1094	8.6	1	1 AR	SIDN	NB
92109601	92 1096	9.6	1	1 AR	LEAN	NB
92109701	92 1097	9.9	1	1 AR	LEAN	NB
92109702	92 1097	9.9	2	1 AR	ISOX	PS
92109501	92 1095	8.6	1	1 AR	LEAN	NB
92109801	92 1098	9.1	1	2 PR	OTTO	IV
92110001	92 1100	9.3	1	2 CN	JELL	PS
92110101	92 1101	11.0	1	2 PR	OTTO	IV
92110102	92 1101	11.0	2	1 UN	POLL	UN
92110201	92 1102	11.0	1	2 PR	OTTO	IV
92110301	92 1103	11.0	1	1 AR	SIDN	NB
92110302	92 1103	11.0	2	1 PO	VAUX	ES

RAYMOND_QUARRY

92110303	92 1103	11.0	3	1 MO	HAPL	EV
92110401	92 1104	8.4	1	1 AR	ANOM	PS
92110402	92 1104	8.4	2	1 UN	POLL	UN
92110501	92 1105	8.4	1	1 AR	ANOM	PS
92110601	92 1106	7.8	1	1 AR	LEAN	NB
92110801	92 1108	10.1	1	1 AR	LEAN	NB
92110901	92 1109	10.9	1	1 AR	LEAN	NB
92111001	92 1110	9.5	1	1 PR	OTTO	IV
92111002	92 1110	9.5	2	4 UN	POLL	UN
92111101	92 1111	8.4	1	1 AR	ANOM	PS
92111301	92 1113	9.0	1	1 AR	HURD	PS
92111401	92 1114	9.8	1	1 PR	OTTO	IV
92111501	92 1115	11.0	1	3 PR	OTTO	IV
92111502	92 1115	11.0	2	2 AR	ALUT	PS
92111601	92 1116	9.6	1	1 PO	CHAN	ES
92111701	92 1117	10.8	1	1 AR	LEAN	NB
92111801	92 1118	10.8	1	1 AR	LEAN	NB
92113001	92 1130	9.0	1	1 PR	OTTO	IV
92113002	92 1130	9.0	2	1 PO	VAUX	ES
92113101	92 1131	8.4	1	1 AR	ANOM	PS
92113201	92 1132	8.3	1	1 AR	SIDN	NB
92113202	92 1132	8.3	2	1 PO	VAUX	ES
92113301	92 1133	8.0	1	2 AR	LEAN	NB
92113401	92 1134	10.2	1	1 AR	ANOD	PS
92113501	92 1135	8.3	1	1 AR	LEAN	NB
92113502	92 1135	8.3	2	2 UN	INWO	UN
92113601	92 1136	8.3	1	1 AR	LEAN	NB
92115001	92 1150	8.0	1	1 AR	SIDN	NB
92115201	92 1152	8.0	1	1 PR	OTTO	IV
92115202	92 1152	8.0	2	1 AR	OLEN	EV
92115203	92 1152	8.0	3	1 AR	LEAN	NB
92115301	92 1153	7.8	1	1 AR	LEAN	NB
92115302	92 1153	7.8	2	1 AR	APPF	PS
92115401	92 1154	8.0	1	1 AR	LEAN	NB
92115501	92 1155	9.7	1	1 AR	LEAN	NB
92115601	92 1156	9.2	1	1 AR	OPAB	PS
92115701	92 1157	7.8	1	1 AR	OPAB	PS
92115801	92 1158	9.8	1	1 AR	SIDN	NB
92115901	92 1159	8.0	1	2 UN	INWO	UN
92116001	92 1160	8.0	1	1 AR	ANOM	PS
92116101	92 1161		1	1 AR	SIDN	NB
92116501	92 1165	NL	1	1 AR	TUZO	UN
92116201	92 1162	NL	1	1 AR	LEAN	NB
92116401	92 1164	9.0	1	1 AR	ANOD	PS
92119301	92 1193	8.4	1	1 PO	CHAN	ES
92119302	92 1193	8.4	2	1 AR	PARK	EV
92119401	92 1194	8.6	1	2 AR	ANOM	PS
92119501	92 1195	8.6	1	1 AR	HURD	PS
92119502	92 1195	8.6	2	2 PR	OTTO	IV
92119503	92 1195	8.6	3	1 VA	SHEL	SH
92119601	92 1196	7.8	1	1 AR	ANOD	PS

RAYMOND_QUARRY

92119602	92 1196	7.8	2	1 PO	VAUX	ES
92119603	92 1196	7.8	3	1 ON	HALL	EV
92119701	92 1197	9.2	1	2 PO	TAKA	ES
92119801	92 1198	9.2	1	1 PO	VAUX	ES
92119901	92 1199	9.5	1	1 AR	LEAN	NB
92120201	92 1202	8.5	1	1 AR	OPAB	PS
92120401	92 1204	8.0	1	1 PR	OTTO	IV
92120402	92 1204	8.0	2	1 AR	AGNO	PS
92120601	92 1206		1	1 PO	CHAN	ES
92120602	92 1206	NL	2	1 AR	ELRA	EV
92121001	92 1210	NL	1	1 AR	LEAN	NB
92120901	92 1209		1	1 AR	MOLL	EV
92120801	92 1208	NL	1	1 AR	LEAN	NB
92120802	92 1208	8.0	2	1 BR	MICR	ES
92120803	92 1208	8.0	3	1 CN	JELL	PS
92121501	92 1215	8.1	1	1 AR	SIDN	NB
92121601	92 1216	8.0	1	1 AR	SIDN	NB
92121701	92 1217	8.0	1	3 AR	LEAN	NB
92121702	92 1217	8.0	2	3 AR	ALUT	PS
92121801	92 1218	8.0	1	1 EC	CREE	EV
92122001	92 1220	7.9	1	1 AR	LEAN	NB
92122101	92 1221	8.4	1	1 AR	INAR	UN
92122102	92 1221	8.4	2	6 AR	AGNO	PS
92122201	92 1222	8.0	1	1 AR	WAPT	NB
92122301	92 1223	8.0	1	1 AR	INAR	UN
92122601	92 1226	8.0	1	2 PR	OTTO	IV
92122801	92 1228	7.8	1	2 UN	BANF	UN
92122901	92 1229	8.0	1	2 AR	LEAN	NB
92122902	92 1229	8.0	2	1 AR	EMER	EV
92122903	92 1229	8.0	3	4 AR	ALUT	PS
92122904	92 1229	8.0	4	1 PO	VAUX	ES
92123001	92 1230	8.1	1	1 AR	SIDN	NB
92123101	92 1231	8.4	1	1 AR	SIDN	NB
92123201	92 1232	8.2	1	1 AR	LEAN	NB
92123401	92 1234	8.0	1	4 UN	INWO	UN
92123402	92 1234	8.0	2	1 AN	POLY	UN
92123501	92 1235	8.4	1	1 UN	INTU	UN
92123502	92 1235	8.4	2	1 UN	INWO	UN
92123503	92 1235	8.4	3	1 AN	POLY	UN
92123601	92 1236	8.1	1	4 PO	CHAN	ES
92123602	92 1236	8.1	2	1 PO	VAUX	ES
92123701	92 1237	8.4	1	1 AR	LEAN	NB
92123801	92 1238	8.0	1	1 AR	LEAN	NB
92123901	92 1239	8.1	1	1 AR	LEAN	NB
92124101	92 1241	8.0	1	1 AR	LEAN	NB
92124102	92 1241	8.0	2	2 PR	OTTO	IV
92124103	92 1241	8.0	3	2 PR	OTTO	IV
92124001	92 1240	8.3	1	1 AN	POLY	UN
92126901	92 1269	8.0	1	1 AR	TUZO	UN
92126902	92 1269	8.0	2	1 BR	NISU	ES
92127001	92 1270	8.3	1	1 PO	CHAN	ES

RAYMOND_QUARRY

92127002	92 1270	8.3	2	1 PO	VAUX	ES
92127003	92 1270	8.3	3	1 EC	CREE	EV
92127004	92 1270	8.3	4	1 BR	MICR	ES
92127201	92 1272	8.0	1	1 AR	LEAN	NB
92127401	92 1274	8.3	1	1 AR	SIDN	NB
92127101	92 1271	8.0	1	1 AR	LEAN	NB
92127102	92 1271	8.0	2	1 AR	ANOM	PS
92127701	92 1277	7.9	1	1 AR	HURD	PS
92127601	92 1276	8.0	1	1 AR	LEAN	NB
92127602	92 1276	8.0	2	1 VA	SHEL	SH
92127801	92 1278	8.5	1	1 AR	SIDN	NB
92127901	92 1279	8.3	1	1 AR	WAPT	NB
92128001	92 1280	9.4	1	1 AR	LEAN	NB
92128101	92 1281	8.4	1	1 AR	ORYC	EV
92128102	92 1281	8.4	2	6 UN	POLL	UN
92128201	92 1282	7.9	1	2 AR	ANOM	PS
92128301	92 1283	8.0	1	1 PR	OTTO	IV
92128302	92 1283	8.0	2	1 AN	TUBU	ES
92128303	92 1283	8.0	3	1 HE	MACK	ES
92130401	92 1304	7.9	1	1 CN	MACK	ES
92130402	92 1304	7.9	2	1 UN	BANF	UN
92130501	92 1305	8.0	1	1 AR	ANOM	PS
92130601	92 1306	8.0	1	1 AR	ANOD	PS
92130701	92 1307	8.0	1	1 AR	SIDN	NB
92130801	92 1308	9.5	1	1 AR	LEAN	NB
92130901	92 1309	7.8	1	1 AR	APPF	PS
92131001	92 1310	9.9	1	1 CN	JELL	PS
92131101	92 1311	8.3	1	1 AR	LEAN	NB
92131102	92 1311	8.3	2	1 PR	OTTO	IV
92131201	92 1312	8.3	1	1 AL	INAL	UN
92131501	92 1315	7.6	1	1 AR	SIDN	NB
92131502	92 1315	7.6	2	6 AR	SIDN	NB
92131503	92 1315	7.6	3	1 PO	VAUX	ES
92131504	92 1315	7.6	4	1 VA	SHEL	SH
92131601	92 1316	7.4	1	1 AR	SIDN	NB
92131602	92 1316	7.4	2	1 PO	VAUX	ES
92131701	92 1317	8.0	1	1 AR	LEAN	NB
92131801	92 1318	8.0	1	1 AR	LEAN	NB
92131901	92 1319	8.3	1	1 UN	INTU	UN
92131902	92 1319	8.3	2	1 UN	INWO	UN
92132001	92 1320	8.3	1	1 AR	LEAN	NB
92132101	92 1321	8.3	1	1 AR	INAR	UN
92132201	92 1322	7.8	1	1 AR	LEAN	NB
92132202	92 1322	7.8	2	1 PR	OTTO	IV
92132301	92 1323	7.4	1	1 AR	TUZO	UN
92132601	92 1326	7.6	1	3 AR	LEAN	NB
92132701	92 1327	7.4	1	1 CN	CAMB	ES
92132702	92 1327	7.4	2	1 AR	LEAN	NB
92132801	92 1328	7.6	1	1 AR	SIDN	NB
92132802	92 1328	7.6	2	1 PO	VAUX	ES
92121201	92 1212		1	1 AR	ISOX	PS

RAYMOND_QUARRY

92113701	92 1137	8.0	1	1 AR	ISOX	PS
92117801	92 0078		1	1 AR	ISOX	PS
92106901	92 1069	10.4	1	1 AR	ISOX	PS
92106902	92 1069	9.0	2	1 AR	ISOX	PS
92094901	92 949		1	1 AR	ISOX	PS
92092101	92 0949	10.0	1	1 AR	ISOX	PS
92120501	92 1205	8.8	1	1 AR	CHAP	EV
92019901	92 0199	9.0	1	1 AR	ISOX	PS
92078101	92 0781	10.8	1	1 AR	ISOX	PS
92120001	92 1200	8.3	1	1 AR	ANOM	PS
92099001	92 0990	9.8	1	1 AR	ISOX	PS
92106801	92 1068	9.3	1	1 AR	ISOX	PS
921201	92 1201	9.5	1	1 AR	ISOX	PS
92120101	92 1201	9.5	2	6 UN	POLL	UN
92120102	92 0902	10.6	1	1 AR	SEAM	PS
92116301	92 1163	7.8	1	1 AR	SEAM	PS
92105901	92 1059	9.5	1	1 AR	OPAB	PS
92026001	92 0260		1	1 AR	SIDN	NB
92121301	92 1213	8.0	1	1 AR	SIDN	NB
92019201	92 0192	11.4	1	1 AR	SIDN	NB
92070001	92 0700	11.4	1	1 AR	HELM	EV
92009101	92 0091	9.9	1	1 AR	SKAN	EV
92027301	92 0273	8.5	1	1 AR	SKAN	EV
92027302	92 0273	8.5	2	1 AR	WAPT	NB
92027303	92 0273	8.5	3	1 UN	POLL	UN
92040101	9 0401	9.1	1	1 AR	SKAN	EV
92047301	92 0473	11.3	1	1 AR	SKAN	EV
92100701	92 1007	8.6	1	1 AR	SKAN	EV
92131301	92 1313	8.1	1	1 UN	INDE	UN
92026801	92 0268	8.0	1	1 AR	MOLL	EV
92025501	92 0255	8.5	1	1 AR	INAR	UN
92104301	92 1043	9.1	1	1 AR	INAR	UN
92082001	92 0820	9.6	1	1 AR	INAR	UN
92042001	92 0420	9.8	1	1 AR	INAR	UN
92070101	92 0701	11.5	1	1 AR	INAR	UN
92031101	92 0311	9.8	1	1 AR	INAR	UN
92062701	92 0627	8.8	1	1 AR	HELM	EV
92019301	92 0193	8.7	1	1 AR	HELM	EV
92065601	92 0656	9.0	1	1 AR	ANOM	PS
92020001	92 0200	11.4	1	1 AR	ANOM	PS
92053001	92 0530	8.5	1	1 AR	LEAN	NB
92060201	92 0602	10.5	1	1 AR	ANOM	PS
92107501	92 1075	8.2	1	36 PO	CHOI	ES
92105001	92 1050	10.1	1	5 EC	ECHM	ES
92057401	92 0574	12.1	1	1 MO	HAPL	EV
92057402	92 0574	12.1	2	1 VA	SHEL	SH
92061501	92 0615	10.9	1	1 UN	INTU	UN
92123301	92 1233	8.3	1	1 UN	INTU	UN
92123302	92 1233	8.3	2	3 UN	INWO	UN
92123303	92 1233	8.3	3	6 AN	POLY	UN
92046001	92 0460	9.4	1	1 AR	SIDN	NB

RAYMOND_QUARRY

92109001	92 1090	8.0	1	1 AR	CHAP	EV
92041201	92 0412		1	1 AR	ANOD	PS
93005601	93 0056	8.6	1	1 AR	ANOM	PS
93005602	93 0056	9.4	2	2 PR	OTTO	IV
93005603	93 0056	9.4	3	1 AR	ISOX	PS
93024401	93 0244	8.4	1	2 AR	ANOM	PS
93025301	93 0253	9.2	1	1 AR	INAR	UN
93024901	93 0249	9.2	1	1 AR	ANOM	PS
93025501	93 0255	9.9	1	1 AR	ANOM	PS
93025502	93 0255	9.9	2	1 UN	INDE	UN
93017301	93 0173	9.0	1	1 AR	ANOM	PS
93026701	93 0267	8.2	1	1 AR	ANOM	PS
93026702	93 0267	8.2	2	2 AR	LEAN	NB
93026703	93 0267	8.2	3	1 AN	TUBU	ES
93030501	93 0305	9.7	1	1 HE	ANOM	PS
93026901	93 0269	9.7	1	1 AR	ANOM	PS
93032101	93 0321	8.8	1	1 AR	ANOD	PS
93035801	93 0358	9.4	1	1 AR	ANOD	PS
93038001	93 0380	9.4	1	1 AR	ANOM	PS
93038002	93 0380	9.4	2	28 AR	PRIS	ES
93038003	93 0380	9.4	3	1 AR	HURD	PS
93038004	93 0380	9.4	4	1 PR	OTTO	IV
93038101	93 0381	9.4	1	1 AR	ANOM	PS
93038102	93 0381	9.4	2	1 AR	SIDN	NB
93038103	93 0381	9.4	3	1 PO	VAUX	ES
93038104	93 0381	9.4	4	1 PR	OTTO	IV
93051901	93 0519	10.1	1	1 AR	ANOM	PS
93051902	93 0519	10.1	2	1 PO	VAUX	ES
93039501	93 0395	10.1	1	1 AR	ANOM	PS
93048201	93 0482		1	1 AR	ANOM	PS
93073701	93 0737	8.4	1	1 AR	ANOM	PS
93068401	93 0684	8.6	1	1 AR	ANOM	PS
93063201	93 0632	10.0	1	1 AR	ANOD	PS
93078301	93 0783	10.9	1	1 AR	ANOM	PS
93075701	93 0757	8.2	1	1 AR	ANOD	PS
93076601	93 0766	10.3	1	1 AR	ANOD	PS
93078901	93 0789	8.8	1	1 AR	ANOD	PS
93110601	93 1106	8.2	1	1 AR	ANOM	PS
93092801	93 0928	13.9	1	1 AR	ANOD	PS
93110501	93 1105	8.2	1	1 AR	ANOD	PS
93112801	93 1128	8.5	1	1 AR	ANOM	PS
93130801	93 1308	13.4	1	1 AR	LAGG	PS
93131001	93 1310	8.3	1	1 AR	LAGG	PS
93131101	93 1311	8.3	1	1 AR	LAGG	PS
93128101	93 1281	13.0	1	1 AR	ANOD	PS
93137901	93 1379	8.9	1	1 AR	ANOD	PS
93133901	93 1339	13.5	1	1 AR	ANOD	PS
93146801	93 1468	11.6	1	1 AR	ANOD	PS
93138701	93 1387	20+	1	1 AR	ANOD	PS
93073801	93 0738	10.5	1	1 AR	HURD	PS
93072301	93 0723	8.0	1	1 UN	INTU	UN

RAYMOND_QUARRY

93072302	93 0723	8.0	2	1 UN	INWO	UN
93072303	93 0723	8.0	3	3 AN	POLY	UN
93072304	93 0723	8.0	4	1 UN	INWO	UN
93072305	93 0723	8.0	5	1 PO	VAUX	ES
93078701	93 0787	8.4	1	1 UN	INTU	UN
93078702	93 0787	8.4	2	1 UN	INWO	UN
93078703	93 0787	8.4	3	2 AN	POLY	UN
93078704	93 0787	8.4	4	3 UN	INWO	UN
93038701	93 0387	8.4	1	1 UN	INTU	UN
93038702	93 0387	8.4	2	1 UN	INWO	UN
93038703	93 0387	8.4	3	1 AN	POLY	UN
93100501	93 1005	8.4	1	1 UN	INTU	UN
93100502	93 1005	8.4	2	1 UN	INWO	UN
93100503	93 1005	8.4	3	1 AN	POLY	UN
93100504	93 1005	8.4	4	1 UN	INTU	UN
93100505	93 1005	8.4	5	1 UN	INWO	UN
93100506	93 1006	8.4	6	1 AN	POLY	UN
93082401	93 1005	10.3	1	1 UN	INTU	UN
93082402	93 0824	10.3	2	1 PR	OTTO	IV
93082403	93 0824	10.3	3	3 AR	PAGE	PS
93143801	93 1438	8.1	1	1 UN	INTU	UN
93143802	93 1438	8.1	2	3 UN	INWO	UN
93143803	93 1438	8.1	3	2 AN	POLY	UN
93100601	93 1006	8.4	1	1 UN	INTU	UN
93100602	93 1006	8.4	2	1 UN	INWO	UN
93100603	93 1006	8.4	3	1 AN	POLY	UN
93100701	93 1007	8.4	1	1 UN	INTU	UN
93100702	93 1007	8.4	2	2 UN	INWO	UN
93100703	93 1007	8.4	3	2 AN	POLY	UN
93109701	93 1097	8.3	1	1 UN	INTU	UN
93109702	93 1097	8.3	2	2 UN	INWO	UN
93109703	93 1097	8.3	3	4 AN	POLY	UN
93109704	93 1097	8.3	4	1 UN	INTU	UN
93109705	93 1097	8.3	5	1 UN	INWO	UN
93109706	93 1097	8.3	6	1 AN	POLY	UN
93109707	93 1097	8.3	7	2 UN	INWO	UN
91122001	91 1220	9.8	1	1 AR	ANOM	PS
91136201	91 1362	9.2	1	1 AR	ANOM	PS
91092401	91 0924	10.6	1	1 AR	LAGG	PS
91010501	91 0105	9.2	1	1 AR	ANOM	PS
91118401	91 1184	10.8	1	1 AR	LAGG	PS
91094401	91 0944	10.5	1	1 AR	ANOM	PS
91079701	91 0797	12.9	1	1 AR	ANOD	PS
91089801	91 0898	10.0	1	1 AR	ANOM	PS
91083301	91 0833	9.3	1	2 AR	ANOM	PS
91083302	91 0833	9.3	2	1 PO	VAUX	ES
91060801	91 0608	8.6	1	1 AR	ANOM	PS
91054701	91 0547	8.3	1	1 AR	ANOM	PS
91031601	91 0316		1	1 AR	ANOD	PS
92048901	92 0489	NL	1	1 AR	ANOM	PS
92120701	92 1207	8.3	1	1 AR	ANOD	PS

RAYMOND_QUARRY

92131401	92 1314	8.0	1	1 AR	ANOM	PS
92115101	92 1151	8.1	1	1 AR	LAGG	PS
92100501	92 1005	9.7	1	1 AR	ANOM	PS
92100502	92 1005	9.7	2	1 BR	MICR	ES
92104001	92 1040	10.0	1	1 AR	HURD	PS
92104002	92 1040	10.0	2	1 PO	HAZE	ES
92100301	92 1003	9.1	1	1 AR	ANOM	PS
92100401	92 1004	10.5	1	1 AR	LAGG	PS
92100402	92 1004	10.5	2	1 AR	OPAB	PS
92100403	92 1004	10.5	3	1 UN	INDE	UN
92097701	92 0977	10.7	1	1 AR	LAGG	PS
92097001	92 0970	9.8	1	1 AR	ANOM	PS
92072301	92 0723	11.1	1	1 AR	ANOM	PS
92055001	92 0550	10.4	1	1 AR	ANOM	PS
92049601	92 0496		1	1 AR	ANOM	PS
92049602	92 0496	8.0	2	10 AR	ALUT	PS
92049603	92 0496	8.0	3	1 AN	TUBU	ES
92042901	92 0429	8.0	1	1 HE	ANOM	PS
92003001	92 0030	9.3	1	1 AR	ANOD	PS
92017501	92 0175	11.2	1	1 AR	LAGG	PS
92039301	92 0393	10.6	1	1 AR	ANOM	PS
92112801	92 1128	8.4	1	1 EC	CREE	EV
92050501	92 0505	9.0	1	1 EC	CREE	EV
92050502	92 0505	9.0	2	1 PO	VAUX	ES
92050401	92 0504	9.0	1	1 EC	CREE	EV
92080001	92 0800	10.1	1	1 CN	JELL	PS
92080002	92 0800	10.1	2	1 EC	CREE	EV
92102701	92 1027	8.4	1	1 EC	CREE	EV
92112901	92 1129	8.4	1	1 EC	CREE	EV
92046701	92 0467		1	1 EC	CREE	EV
92102001	92 1020	8.8	1	1 EC	CREE	EV
93065401	93 0654	8.9	1	1 EC	CREE	EV
93063801	93 0638	9.0	1	1 EC	CREE	EV
93062601	93 0626	8.9	1	1 EC	CREE	EV
93062602	92 0626	8.9	2	1 PO	VAUX	ES
93060401	93 0604	8.9	1	1 EC	CREE	EV
93056501	93 0565	8.8	1	1 EC	CREE	EV
93113101	93 1131	8.6	1	1 EC	CREE	EV
93088001	93 0880	9.4	1	1 EC	CREE	EV
93088002	93 0880	9.4	2	1 PO	VAUX	ES
93074401	93 0744	9.2	1	1 EC	CREE	EV
93074402	93 0744	9.2	2	1 PO	VAUX	ES
93113201	93 1132	8.3	1	1 AR	ODAR	PS
93113202	93 1132	8.3	2	2 AR	ANOM	PS
93113203	93 1132	8.3	3	1 EC	CREE	EV
93113204	93 1132	8.3	4	1 PO	VAUX	ES
93010801	93 0108	8.3	1	1 EC	CREE	EV
93010802	93 0108	8.3	2	4 UN	POLL	UN
93165401	93 1654	9.7	1	1 EC	CREE	EV
93092901	93 0929	9.2	1	1 EC	CREE	EV
93088001	93 0880	9.4	1	1 EC	CREE	EV

RAYMOND_QUARRY

9388002	93 0880	9.4	2	1 PO	VAUX	ES
93088002	93 0405	8.9	1	1 EC	CREE	EV
93040502	93 0405	8.9	2	1 PO	VAUX	ES
93040601	93 0406	9.3	1	1 EC	CREE	EV
93031301	9 0313	8.8	1	1 EC	CREE	EV
93042501	93 0425	8.7	1	1 EC	CREE	EV
93038901	93 0389	9.0	1	1 EC	CREE	EV
93038902	93 0389	9.0	2	1 PO	VAUX	ES
93034801	93 0348	8.8	1	1 EC	CREE	EV
93031701	93 0317	8.8	1	1 EC	CREE	EV
93031702	93 0317	8.8	2	1 PO	VAUX	ES
93056001	93 0560		1	1 EC	CREE	EV
93032801	93 0328	8.3	1	1 EC	CREE	EV
93017801	92 0178	9.3	1	1 EC	CREE	EV
93017802	93 0178	9.0	2	1 PO	VAUX	ES
93023701	93 0237	9.3	1	1 EC	CREE	EV
93027101	92 0271	10.2	1	1 EC	CREE	EV
93027102	93 0271	10.2	2	1 PR	OTTO	IV
93030701	93 0307	8.8	1	1 EC	CREE	EV
93026501	93 0265	9.7	1	1 EC	CREE	EV
93032801	93 0328	8.8	1	1 EC	CREE	EV
93003301	93 0033	9.1	1	1 EC	CREE	EV
93003401	93 0034	8.6	1	1 EC	CREE	EV
93011001	93 0110	8.9	1	1 EC	CREE	EV
93011002	93 0110	8.9	2	1 PO	VAUX	ES
93017601	93 0176	8.7	1	1 EC	CREE	EV
91118501	91 1185	9.0	1	1 AR	ANOM	PS
92060101	92 0601	9.4	1	1 AR	ANOM	PS
91135901	91 1359	8.8	1	1 AR	ANOM	PS
92097601	92 0976	9.7	1	3 EC	ECHM	ES
92099301	92 0993	9.1	1	4 EC	ECHM	ES
92105001	92 1050	10.1	1	6 EC	ECHM	ES
93105603	93 1056	13.1	3	2 MO	HAPL	EV
93010302	93 0103	8.7	2	1 MO	HAPL	EV
0	0		0	0		
	0		0	0		

RAYMOND_QUARRY

FEEDING NOTES

UN	
CS	MOU
DS	
CS	
CS	MOU
CS	MOU
CS	MOU
SU	
CS	ROT
CS	MOU
CS	ROT
SU	
DS	MOU
CS	MOU
CS	MOU
CS	MOU
CS	MOU
CS	MOU
UN	
CS	MOU
CS	ROT
CS	MOU
CS	
DS	
UN	
SU	
CS	ROT
CS	MOU
CS	MOU
CS	MOU
CS	MOU
DS	MOU
CS	MOU
CS	MOU
CS	MOU
SU	
CS	ROT
CS	MOU
DS	
CS	ROT
CS	
CS	ROT
CS	MOU
CS	MOU
CS	MOU
CS	
CS	MOU
CS	ROT
CS	MOU
CS	GTI

RAYMOND_QUARRY

CS	ROT
CS	ROT
CS	ROT
DS	MOU
CS	MOU
CS	
CS	MOU
CS	ROT
CS	MOU
CS	ROT
UN	
SU	
CS	MOU
CS	ROT
UN	
CS	MOU
CS	MOU
CS	MOU
CS	MOU
CS	MOU
CS	MOU
CS	MOU
CS	MOU
CS	MOU
CS	ROT
CS	MOU
CS	MOU
CS	MOU
CS	MOU
CS	MOU
SU	
CS	MOU
CS	MOU
CS	ROT
UN	
CS	MOU
SU	
SU	
CS	MOU
CS	MOU
CS	
CS	MOU
SU	
CS	ROT
CS	ROT
UN	
CS	ROT
SU	
SU	
CS	ROT
CS	MOU

RAYMOND_QUARRY

[illegible]

RAYMOND_QUARRY

SU	
CS	
DS	
DS	
SU	
SU	MOU
SU	
CS	
SU	
SU	
SU	
CS	MOU
SU	
SU	
SU	
SU	
CS	
SU	
SU	
SU	
UN	
DS	
UN	ART
UN	PRE
UN	ART
UN	ART
DS	
UN	ART
DS	
DS	
DS	
DS	
DS	
SU	
SU	
UN	
DS	
DS	
UN	
DS	
DS	
DS	
DS	
DS	
DS	
DS	
UN	
DS	
DS	
DS	
SU	

RAYMOND_QUARRY

SU	
DS	
DS	
UN	ART
CS	
CS	MOU
UN	MOU
CS	MOU
CS	JUV
CS	MOU
CS	MOU
CS	MOU
CS	MOU
CS	MOU
CS	
CS	ROT
SU	
SU	
CS	MOU
CS	
UN	
CS	MOU
CS	MOU
SU	
UN	
UN	
UN	
DS	
DS	
UN	
UN	
DS	
UN	
DS	
SU	
UN	
UN	
DS	
SU	
SU	
SU	
SU	
DS	
SU	
UN	
SU	
SU	
SU	
SU	
UN	
SU	

RAYMOND_QUARRY

SU	
SU	
SU	
SU	
SU	
SU	
SU	
SU	
SU	
SU	BAS
SU	
SU	
CS	
CS	
SU	
CS	
CS	
CS	
CS	
CS	
CS	GTI
SU	BAS
CS	
CS	
DS	MOU
CS	
CS	
SU	
CS	
CS	
CS	
CS	
DS	
SU	
CS	
SU	
SU	
UN	
SU	
SU	
UN	
DS	
DS	
SU	
DS	
UN	
UN	
DS	
DS	
DS	
DS	
UN	

RAYMOND_QUARRY

DS	
UN	
DS	
UN	
UN	MOU
UN	
DS	
SU	
UN	
UN	
UN	
SU	
DS	
UN	
UN	
CS	ROT
UN	
CS	
UN	
DS	
UN	
UN	
CS	
UN	
UN	
UN	
UN	
DS	SOF
DS	SOF
DS	SOF
DS	SOF
DS	SOF
DS	SOF
DS	SOF
SU	SOF
SU	SOF
DS	SOF
SU	SOF
SU	SOF
SU	SOF
SU	SOF
SU	SOF
SU	
SU	
SU	
SU	
CS	
CS	
CS	
CS	
UN	

RAYMOND_QUARRY

UN	
UN	
UN	
UN	
UN	
UN	
UN	
UN	
PH	WOR
UN	
PH	
PH	
PH	WOR
UN	
UN	
SU	
PH	WOR
UN	
SU	
UN	
PH	
UN	WOR
DS	
UN	
UN	
UN	WOR
UN	
UN	OTH
UN	
SU	
UN	OTH
UN	
UN	
UN	
UN	WOR
UN	
UN	
UN	WOR
UN	
UN	WOR
DS	
UN	
UN	
UN	OTH
SU	
CS	
CS	
UN	
CS	
PH	
UN	
DS	

RAYMOND_QUARRY

UN	
SU	DFR
CS	
UN	
UN	
SU	
UN	WOR
UN	
UN	
SU	
UN	
DS	
UN	
SU	
UN	
CS	
UN	
UN	
SU	
UN	
CS	MOU
SU	
CS	
UN	
UN	
UN	
CS	GTI
DS	PRE
UN	WOR
DS	
CS	
DS	
SU	
UN	
UN	
UN	
UN	
CS	
DS	
SU	
SU	
UN	
UN	
CS	
CS	
CS	
SU	
CS	
CS	
CS	GTI

RAYMOND_QUARRY

CS	
UN	
CS	GTU
CS	
UN	
UN	
CS	
CS	
SU	
CS	GTU
CS	
SU	
CS	
CS	
CS	
CS	
SU	
CS	
CS	
SU	
CS	
CS	GTU
CS	
UN	
CS	
CS	MOU
CS	
UN	
CS	
UN	WOR
UN	
CS	
CS	
CS	
CS	
CS	
DS	
CS	
CS	
CS	GTU
CS	
CS	
CS	
CS	
SU	
CS	
SU	
SU	
SU	
CS	
CS	

RAYMOND_QUARRY

CS	MOU
CS	
SU	
DS	
CS	
CS	
CS	
DS	
CS	
CS	
CS	
CS	
CS	
DS	
CS	GTI
CS	GTI
CS	GTI
DS	
DS	
CS	
CS	
SU	
SU	
CS	
CS	
CS	
CS	GTI
DS	
CS	
CS	
CS	
DS	MOU
CS	
CS	
CS	
SU	
UN	MOU
CS	
UN	ART
CS	
SU	
UN	ART
DS	
UN	ART
UN	ART
UN	MOU
UN	ART
UN	MOU
UN	ART
UN	ART

RAYMOND_QUARRY

UN	ART
CS	
SU	
UN	ART
UN	ART
UN	ART
UN	MOU
UN	MOU
UN	ART
UN	MOU
UN	ART
UN	ART
CS	
DS	
UN	MOU
DS	
CS	
UN	
SU	
DS	
DS	
DS	
DS	
DS	
DS	
DS	
DS	
DS	
CS	
SU	
DS	
DS	MOU
DS	
DS	
CS	
UN	
DS	
DS	
CS	
CS	MOU
DS	
SU	
SU	
SU	
DS	
CS	
DS	
CS	MOU
SU	
DS	
DS	
DS	MOU

RAYMOND_QUARRY

SU	
DS	MOU
DS	MOU
CS	
SU	
CS	
DS	
DS	
DS	MOU
DS	
DS	
SU	
SU	
SU	BAS
UN	
SU	
SU	
SU	EYE
CS	
DS	
UN	
SU	
SU	
SU	
SU	
SU	
SU	
SU	
SU	
SU	
SU	
SU	
SU	
SU	
SU	
SU	
SU	
SU	
UN	
DS	
SU	
SU	
SU	BAS
SU	
SU	BAS
SU	
DS	

RAYMOND_QUARRY

SU	
SU	BAS
DS	
SU	
SU	
SU	
SU	
SU	BAS
SU	
CS	MOU
SU	
SU	
SU	
CS	MOU
SU	
SU	
SU	
SU	SOF
SU	
UN	
SU	
SU	
CS	MOU
SU	
SU	BAS
SU	SOF
SU	
SU	
SU	
SU	
SU	
SU	
SU	
SU	
SU	
SU	
SU	SOF
CS	
SU	
SU	
CS	
SU	
SU	
SU	
SU	
SU	
SU	
CS	
SU	
SU	

RAYMOND_QUARRY

SU	
SU	
SU	
SU	
SU	
SU	
SU	
SU	
SU	
SU	
DS	SOF
SU	
SU	BAS
SU	
SU	BAS
CS	MOU
CS	MOU
CS	MOU
CS	MOU
CS	
CS	
CS	MOU
CS	MOU
CS	MOU
CS	MOU
CS	MOU
CS	MOU
CS	MOU
DS	
CS	MOU
CS	MOU
CS	MOU
CS	MOU
SU	
CS	MOU
CS	
CS	MOU
CS	MOU
CS	MOU
UN	PYR
CS	MOU
CS	MOU
DS	SOF
CS	MOU
CS	
CS	
SU	
SU	
SU	
SU	

RAYMOND_QUARRY

SU	
SU	
UN	
SU	
SU	
SU	
SU	
SU	
SU	
SU	
SU	
SU	
SU	
SU	
SU	
SU	
SU	
SU	
CS	
SU	
SU	
SU	
CS	
SU	
DS	SOF
CS	
CS	MOU
CS	MOU
SU	
CS	MOU
CS	
CS	GTU
CS	
CS	
CS	
CS	
CS	MOU
CS	
SU	
SU	
CS	
CS	
CS	MOU
SU	
CS	MOU
CS	
CS	
SU	
CS	
CS	
CS	GTU

RAYMOND_QUARRY

CS	MOU
CS	GTU
CS	GTU
CS	
CS	GTU
CS	MOU
CS	MOU
CS	
CS	MOU
CS	
SU	
CS	GTU
CS	
SU	
CS	GTU
SU	
CS	
CS	MOU
CS	MOU
CS	MOU
CS	MOU
CS	
CS	
SU	
CS	MOU
SU	
CS	MOU
SU	
CS	
SU	
SU	
CS	MOU
CS	
CS	MOU
CS	
CS	MOU
CS	MOU
CS	MOU
CS	MOU
SU	
CS	
SU	
CS	GTU
CS	GTU
CS	MOU
CS	GTU
CS	GTU
CS	
CS	

RAYMOND_QUARRY

UN	
CS	
SU	
CS	
CS	
SU	
CS	MOU
CS	MOU
CS	GTU
SU	
CS	
CS	
CS	
CS	GTU
CS	
SU	
CS	MOU
CS	
CS	GTU
CS	MOU
CS	MOU
CS	
CS	GTU
SU	
UN	
CS	
CS	
DS	MOU
DS	GTU
SU	
DS	MOU
DS	
DS	GTU
DS	GTU
SU	
SU	
DS	
DS	
DS	GTU
DS	GTU
DS	GTU
UN	
SU	
DS	GTU
DS	GTU
DS	
DS	
DS	GTU
DS	GTU
SU	
DS	GTU

RAYMOND_QUARRY

CS	MOU
CS	
SU	
SU	
SU	
DS	
CS	
DS	
DS	
DS	
CS	
SU	
DS	
SU	
DS	GTU
CS	
DS	GTU
UN	
UN	
DS	
DS	GTU
SU	
DS	GTU
DS	
DS	GTU
SU	
DS	
DS	
DS	
DS	
DS	
DS	
SU	
DS	
DS	GTU
DS	GTU
DS	
DS	MOU
DS	
SU	
SU	
DS	GTU
SU	
UN	
DS	GTU
DS	GTU
DS	GTU
DS	MOU
DS	GTU
SU	
DS	GTU

RAYMOND_QUARRY

DS	GTU
DS	
CS	
DS	GTU
DS	
DS	MOU
DS	GTU
DS	
SU	
SU	
DS	
DS	GTU
DS	
CS	
DS	GTU
DS	GTU
DS	GTU
DS	MOU
DS	GTU
DS	GTU
DS	
SU	
DS	
CS	
DS	GTU
CS	MOU
UN	
DS	
CS	
SU	
SU	
DS	GTU
UN	MOU
DS	GTU
DS	
CS	
DS	GTU
CS	
DS	GTU
DS	MOU
UN	
DS	GTU
SU	
DS	
SU	
DS	GTU
DS	GTU
DS	
UN	
DS	GTU
CS	

RAYMOND_QUARRY

DS	GTU
DS	GTU
DS	GTU
DS	GTU
DS	GTU
CS	
SU	
DS	GTU
CS	
SU	
UN	
CS	MOU
CS	MOU
CS	MOU
CS	MOU
CS	MOU
CS	MOU
CS	MOU
CS	MOU
CS	MOU
SU	
SU	
CS	MOU
UN	
CS	MOU
CS	MOU
SU	
CS	MOU
CS	MOU
CS	MOU
CS	MOU
SU	
CS	MOU
SU	
CS	ROT
CS	MOU
CS	
CS	MOU
CS	MOU
DS	
DS	
CS	
CS	
CS	
CS	
DS	
UN	
CS	
CS	PYR
SU	

RAYMOND_QUARRY

SU
CS
CS
CS
CS
UN
CS
CS
CS
CS
CS
DS
SU
CS
CS
CS
CS
SU
CS
CS
CS
SU
CS
CS
SU
CS
CS
SU
CS
CS
DS
CS
CS
CS
UN
CS
SU
CS
CS
DS
CS
CS
CS
CS
CS
SU
CS
CS
CS
SU
CS
DS
CS
CS

GTI

RAYMOND_QUARRY

CS	
CS	
CS	
CS	
CS	
CS	
CS	
DS	
SU	
CS	
SU	
CS	
CS	
SU	
SU	
CS	
CS	
CS	
SU	
SU	
CS	
CS	
SU	
CS	
CS	
CS	GTU
CS	
CS	
CS	
CS	GTU
DS	
DS	
CS	
SU	
CS	
CS	
CS	
CS	
CS	
CS	
CS	
CS	
SU	
CS	GTU
CS	
DS	
CS	MOU
CS	
CS	
CS	MOU
CS	

RAYMOND_QUARRY

CS	
CS	
CS	
CS	GTU
CS	
CS	
SU	
SU	
CS	GTU
CS	
SU	
SU	
UN	
CS	
CS	
DS	
CS	
CS	
CS	
CS	
DS	
CS	
CS	
CS	
CS	
CS	
CS	
CS	
CS	MOU
DS	
UN	
SU	
CS	
CS	
CS	
CS	
CS	
CS	
CS	
CS	
CS	MOU
CS	
CS	
DS	
CS	ROT
DS	
SU	
CS	
CS	
CS	
CS	
CS	

RAYMOND_QUARRY

CS	
CS	
CS	
CS	
DS	
CS	
CS	
CS	
CS	
SU	
CS	
UN	MOU
CS	
CS	
DS	
CS	
CS	
SU	
CS	
CS	
SU	
CS	
CS	
SU	
CS	
CS	JUV
CS	
DS	
SU	
SU	
CS	
CS	GTU
CS	
DS	
CS	
CS	
CS	
SU	
CS	
SU	
CS	
SU	
CS	
SU	
CS	
CS	
CS	
CS	
DS	
CS	

RAYMOND_QUARRY

DS	
SU	
CS	
CS	GTU
CS	
CS	
CS	
CS	
SU	
CS	
SU	
CS	
SU	
CS	
CS	
SU	
CS	
CS	
CS	
CS	MOU
DS	
CS	
CS	GTI
CS	
DS	
CS	
CS	MOU
CS	
CS	MOU
CS	
CS	GTU
SU	
CS	
CS	
SU	
DS	GTU
DS	GTU
DS	GTU
SU	
DS	
DS	
SU	
DS	GTU
UN	
DS	GTU
CS	
DS	GTU
DS	MOU
DS	
DS	
DS	GTU

RAYMOND_QUARRY

CS	GTU
CS	GTU
UN	
DS	GTU
DS	GTU
DS	GTU
DS	GTU
DS	GTU
DS	GTU
DS	
DS	GTU
DS	GTU
DS	GTU
DS	
SU	
DS	GTU
SU	
DS	MOU
DS	
SU	
DS	GTU
DS	GTU
DS	GTU
DS	GTU
CS	MOU
SU	
DS	GTU
CS	MOU
DS	
SU	
DS	
DS	
DS	
DS	GTU
SU	
SU	
SU	
DS	
DS	GTU
DS	
CS	
CS	MOU
SU	
DS	
DS	GTU
DS	MOU
DS	GTU
DS	GTU
UN	
DS	JUV
DS	
SU	

RAYMOND_QUARRY

DS	MOU
DS	
DS	GTU
DS	
DS	GTU
SU	
DS	GTU
CS	
CS	
DS	
DS	GTU
SU	
UN	
DS	GTU
DS	GTU
DS	GTU
DS	
SU	
DS	GTU
DS	
DS	GTU
UN	
SU	
DS	MOU
DS	GTU
CS	
DS	GTU
DS	GTU
SU	
DS	
DS	
DS	GTU
DS	GTU
DS	GTU
CS	MOU
DS	
DS	
DS	
SU	
DS	GTU
DS	MOU
DS	
DS	
DS	GTU
DS	GTU
CS	
DS	GTU
DS	
DS	GTU
DS	GTU
DS	GTU

RAYMOND_QUARRY

UN	
DS	GTU
DS	
DS	
SU	
DS	
DS	GTU
DS	GTU
DS	
DS	
DS	GTU
DS	GTU
DS	GTU
DS	GTU
DS	
DS	GTU
DS	GTU
DS	GTU
DS	MOU
CS	
DS	MOU
SU	
SU	
DS	
SU	
DS	
DS	GTU
DS	
DS	
DS	
CS	
SU	
DS	
DS	
DS	
DS	GTU
DS	
DS	GTU
UN	
DS	GTU
DS	GTU
DS	GTU
UN	
SU	
DS	GTU
DS	GTU
DS	GTU
DS	GTU
DS	PRE
UN	

RAYMOND_QUARRY

DS	
CS	MOU
SU	
SU	
SU	
CS	
DS	MOU
PH	WOR
UN	
SU	ATT
SU	
SU	ATT
SU	
SU	
DS	APP
SU	
CS	GTU
UN	
CS	
DS	
CS	
CS	EYE
SU	
DS	PYR
CS	
DS	
DS	
DS	
SU	
SU	
SU	
SU	
SU	
DS	
DS	
CS	GTU
SU	
CS	
DS	MOU
CS	
UN	MOU
SU	
SU	
SU	
CS	MOU
UN	
UN	MOU
CS	
CS	MOU
SU	

RAYMOND_QUARRY

CS	
DS	
DS	
CS	
UN	
UN	
UN	
DS	GTU
CS	MOU
SU	
DS	MOU
DS	
CS	ROT
UN	MOU
UN	
CS	MOU
CS	
CS	MOU
DS	
CS	MOU
CS	
CS	MOU
DS	MOU
UN	MOU
SU	
CS	
UN	MOU
CS	
UN	
CS	MOU
DS	
CS	
SU	
CS	
DS	GTU
CS	
CS	
DS	
DS	GTU
SU	
SU	
UN	
SU	
CS	
CS	MOU
SU	
CS	MOU
CS	MOU
CS	MOU
CS	
DS	

RAYMOND_QUARRY

CS	
CS	
CS	
CS	
DS	GTU
DS	GTU
SU	
CS	
CS	
DS	
DS	
DS	GTU
DS	
CS	
CS	MOU
UN	
CS	GTU
CS	
UN	
UN	MOU
DS	MOU
DS	GTU
CS	MOU
CS	
CS	MOU
UN	
DS	MOU
SU	
SU	
SU	
DS	GTU
DS	GTU
UN	
DS	
DS	MOU
UN	
DS	
DS	GTU
SU	
SU	
DS	GTU
SU	
UN	
UN	
DS	
DS	MOU
DS	GTU
DS	MOU
DS	GTU
DS	
UN	

RAYMOND_QUARRY

DS	
SU	
DS	APP
DS	
CS	
CS	MOU
SU	
CS	MOU
UN	
CS	
DS	PRE
CS	
DS	
UN	
DS	
CS	
CS	
SU	
CS	
DS	GTU
SU	
CS	MOU
DS	
CS	
CS	ROT
CS	
CS	ROT
DS	GTU
DS	GTU
DS	
CS	GTI
CS	
CS	
CS	
CS	
CS	
DS	
UN	MOU
CS	
DS	
CS	
UN	
CS	MOU
DS	MOU
CS	
DS	
UN	MOU
DS	
DS	GTU
CS	MOU
CS	

RAYMOND_QUARRY

DS	
UN	
UN	
DS	
DS	
CS	
DS	
UN	
UN	
DS	MOU
CS	
UN	
SU	
CS	
CS	
DS	MOU
UN	
DS	
CS	
CS	
CS	
DS	
CS	
CS	ROT
SU	
CS	MOU
CS	
SU	
SU	
DS	EYE
DS	
CS	
DS	
CS	
UN	
CS	ROT
DS	GTU
CS	MOU
CS	
CS	ROT
DS	
DS	GTU
DS	
SU	
CS	
CS	
CS	
UN	
CS	
UN	
CS	

RAYMOND_QUARRY

CS	MOU
UN	
UN	
CS	
UN	
CS	
UN	
SU	
UN	
CS	
CS	MOU
UN	
CS	
DS	SOF
CS	
CS	
UN	
UN	
DS	PRE
CS	
CS	MOU
CS	MOU
DS	GTU
UN	
DS	
UN	
CS	
DS	
SU	
UN	
SU	
DS	
DS	ROT
DS	
DS	
UN	MOU
DS	GTU
CS	MOU
DS	GTU
SU	
DS	GTU
DS	MOU
DS	GTU
DS	
UN	MOU
CS	
SU	
UN	
DS	
CS	
DS	

RAYMOND_QUARRY

SU	
SU	
SU	
CS	
UN	
DS	
CS	
DS	MOU
CS	
UN	
SU	PYR
DS	GTU
DS	
DS	
DS	
CS	
CS	
CS	
CS	
DS	
DS	
CS	PRE
CS	MOU
DS	
DS	
SU	
DS	GTU
DS	
DS	GTU
UN	
UN	
CS	
DS	GTU
CS	
CS	MOU
CS	MOU
UN	
SU	
CS	
CS	
DS	
DS	
CS	
UN	
CS	
UN	
UN	
UN	
CS	
UN	
CS	

RAYMOND_QUARRY

CS	
DS	MOU
CS	GTU
UN	MOU
DS	
CS	
CS	
UN	
CS	
DS	
CS	
DS	MOU
UN	
UN	
CS	GLU
CS	
CS	MOU
SU	
DS	
DS	
DS	GTU
UN	
CS	GTU
DS	GTU
DS	
CS	
DS	
CS	MOU
DS	MOU
CS	
DS	MOU
UN	
DS	PRE
DS	GTU
DS	
DS	MOU
UN	MOU
SU	
UN	MOU
DS	APP
UN	
CS	ROT
CS	GTU
CS	
DS	GTU
DS	
CS	
CS	
SU	
CS	
DS	MOU

RAYMOND_QUARRY

UN	
SU	
DS	MOU
CS	
CS	
SU	
CS	
CS	
SU	
DS	
PH	
PH	
CS	MOU
CS	MOU
DS	
CS	
DS	
CS	MOU
DS	
SU	
SU	
DS	
SU	
CS	MOU
SU	
CS	MOU
SU	
UN	
CS	MOU
CS	
CS	
CS	GTU
CS	
DS	
DS	
DS	
CS	MOU
DS	GTU
UN	
CS	
CS	
DS	GTU
CS	
UN	
SU	
CS	MOU
CS	
SU	
DS	MOU
DS	MOU
CS	MOU

RAYMOND_QUARRY

UN	MOU
DS	
CS	MOU
CS	MOU
SU	ATT
SU	SOF
SU	
SU	
UN	
CS	MOU
UN	
DS	GTU
CS	
SU	
CS	
CS	MOU
CS	
UN	
CS	
CS	
CS	
CS	MOU
DS	
DS	GTU
CS	MOU
UN	
SU	BAS
DS	
CS	
DS	GTU
CS	
SU	
CS	MOU
DS	GTU
DS	
CS	
CS	
UN	
DS	GTU
CS	
CS	
CS	GTU
SU	
CS	
CS	
CS	
CS	MOU
CS	MOU
SU	
CS	
CS	

RAYMOND_QUARRY

UN	
UN	MOU
DS	GTU
CS	
SU	
DS	
DS	
SU	
UN	
DS	
DS	
UN	MOU
CS	
CS	
DS	MOU
UN	
CS	
DS	MOU
CS	
CS	
UN	
DS	MOU
CS	
CS	
CS	MOU
CS	
SU	
CS	GTU
CS	
SU	
UN	MOU
SU	
SU	
SU	
UN	MOU
DS	GTU
UN	
CS	MOU
DS	
SU	
CS	MOU
CS	
CS	MOU
DS	
UN	
UN	
CS	MOU
CS	
CS	MOU
DS	MOU

RAYMOND_QUARRY

UN	
CS	MOU
CS	GTI
DS	
DS	MOU
CS	MOU
CS	MOU
DS	
DS	
CS	
CS	GTU
DS	
CS	MOU
DS	MOU
SU	
DS	
SU	
SU	
UN	
CS	
CS	MOU
CS	
CS	
CS	
CS	
CS	MOU
SU	
CS	MOU
CS	
UN	
DS	
DS	MOU
CS	
CS	
DS	GTU
DS	GTU
DS	
CS	ROT
CS	MOU
DS	GTU
CS	EYE
DS	MOU
SU	
SU	SOF
CS	ROT
CS	
SU	
CS	MOU
SU	SOF
CS	

RAYMOND_QUARRY

DS	
CS	ROT
SU	
CS	MOU
UN	MOU
DS	MOU
UN	
UN	
CS	
SU	
CS	
DS	
UN	
DS	GTU
UN	MOU
DS	
DS	
CS	MOU
CS	MOU
SU	
CS	MOU
DS	GTU
CS	ROT
DS	
DS	
DS	
UN	MOU
CS	
DS	MOU
DS	MOU
DS	
CS	MOU
CS	MOU
CS	MOU
CS	
DS	GTU
CS	
CS	MOU
UN	
DS	
DS	MOU
DS	
DS	
SU	
CS	MOU
UN	
CS	MOU
SU	

RAYMOND_QUARRY

SU	
DS	PRE
CS	GTI
CS	MOU
DS	GTU
CS	MOU
DS	MOU
CS	
DS	
SU	
UN	MOU
DS	
SU	MOU
UN	
CS	
DS	PRE
DS	
UN	MOU
UN	
SU	
SU	
CS	EYE
DS	
UN	MOU
CS	
DS	
CS	MOU
SU	
DS	
SU	
CS	GTU
CS	
DS	MOU
DS	
DS	ROT
DS	
DS	GTU
DS	GTU
UN	
CS	MOU
SU	
DS	GTU
UN	
SU	MOU
CS	MOU
SU	
DS	GTU
DS	MOU
UN	MOU
CS	GTI

RAYMOND_QUARRY

DS	
CS	
DS	MOU
DS	
UN	
CS	
SU	BAS
SU	
UN	
CS	MOU
SU	
DS	ROT
SU	
SU	
DS	
DS	
DS	GTU
SU	
SU	ATT
CS	MOU
DS	ROT
CS	MOU
UN	
SU	ATT
SU	
DS	MOU
DS	
DS	
CS	
SU	
UN	
DS	
DS	
SU	
UN	MOU
SU	
CS	MOU
CS	MOU
CS	MOU
CS	ROT
CS	MOU
CS	
CS	GTU
CS	
UN	MOU
UN	
SU	
CS	MOU
DS	GTU

RAYMOND_QUARRY

DS	
SU	
SU	
DS	ROT
SU	ATT
SU	SOF
CS	MOU
CS	ROT
UN	MOU
SU	
CS	MOU
CS	MOU
SU	

SU	
DS	
CS	
DS	
CS	MOU
DS	GTU
SU	
CS	MOU
DS	
DS	ROT
CS	ROT
CS	MOU
CS	

DS	
CS	MOU
CS	MOU
DS	GTU
DS	
CS	
SU	
SU	
CS	
CS	MOU
CS	ROT
CS	
SU	SOF
DS	MOU

SU	
UN	

SU	
UN	
DS	
UN	
UN	

RAYMOND_QUARRY

DS	
DS	
DS	
UN	
SU	
UN	MOU
UN	
SU	
SU	
CS	
UN	MOU
SU	
DS	
CS	
CS	
DS	GTU
DS	
CS	MOU
DS	
CS	
CS	
SU	
CS	
CS	GTI
DS	PRE
CS	
DS	
CS	MOU
CS	MOU
SU	ROT
CS	ROT
CS	ROT
CS	
CS	
DS	SOF
CS	MOU
CS	
DS	GTU
UN	
CS	
CS	MOU
CS	MOU
DS	
CS	
UN	MOU
UN	MOU
CS	
SU	
CS	MOU
CS	MOU

RAYMOND_QUARRY

DS	ROT
CS	
SU	
SU	
CS	
DS	
CS	
DS	
CS	
DS	
CS	
CS	ROT
CS	
DS	
CS	MOU
CS	GTU
DS	GTU
DS	ROT
DS	
UN	MOU
CS	
DS	ROT
CS	
DS	ROT
CS	MOU
UN	
SU	
UN	
CS	MOU
DS	MOU
CS	
DS	GTU
DS	ROT
DS	
DS	
CS	MOU
DS	
DS	
CS	
DS	
SU	
UN	
SU	
DS	
DS	
CS	MOU
CS	
DS	MOU
DS	
DS	PRE
DS	
SU	

RAYMOND_QUARRY

CS	MOU
SU	
CS	
UN	
DS	
UN	
UN	MOU
SU	
CS	MOU
CS	MOU
DS	
DS	
SU	
DS	GTU
CS	GLU
CS	
DS	
UN	MOU
DS	
CS	
UN	MOU
PH	
CS	MOU
CS	MOU
CS	MOU
CS	MOU
CS	GLU
CS	ROT
CS	MOU
UN	
CS	
SU	
CS	ROT
CS	MOU
CS	
UN	
CS	
CS	
CS	MOU
SU	
CS	
UN	MOU
DS	
CS	GTI
DS	PRE
CS	
CS	
UN	
DS	
CS	MOU
DS	

RAYMOND_QUARRY

CS	ROT
CS	MOU
SU	
DS	
DS	
UN	
CS	
SU	
CS	
SU	
UN	
DS	PRE
DS	
CS	
UN	
DS	
SU	
SU	
UN	
CS	
CS	
SU	SOF
SU	
SU	
CS	
DS	GTU
SU	
CS	MOU
CS	
CS	MOU
UN	
CS	MOU
CS	
CS	GTI
DS	PRE
SU	
CS	
CS	MOU
DS	MOU
CS	
CS	
CS	
CS	
CS	GTU
CS	MOU
DS	
DS	
CS	ROT
DS	GTU

RAYMOND_QUARRY

DS	
CS	ROT
CS	MOU
CS	
DS	GTU
DS	
CS	
CS	
CS	ROT
CS	GTU
SU	
CS	GTI
DS	PRE
CS	
UN	
CS	MOU
CS	ROT
DS	MOU
UN	MOU
CS	
SU	
CS	MOU
CS	GTU
SU	
SU	
CS	
CS	MOU
CS	GTU
CS	
SU	
CS	
SU	
SU	
CS	MOU
CS	ROT
SU	
CS	
CS	
CS	
CS	
CS	
CS	
CS	
SU	
SU	
SU	
CS	
UN	MOU
UN	MOU
SU	
CS	
CS	

RAYMOND_QUARRY

CS	ROT
CS	
SU	
SU	
SU	
SU	
DS	MOU
DS	GTU
DS	
DS	MOU
CS	MOU
SU	
CS	
DS	MOU
UN	MOU
UN	
CS	
DS	
UN	
UN	
DS	
CS	
DS	GTU
UN	
SU	BAS
DS	
UN	MOU
CS	
CS	
DS	GTU
CS	MOU
DS	GTU
DS	
UN	
SU	
CS	MOU
CS	GTU
SU	
CS	
DS	
DS	
CS	MOU
CS	MOU
DS	
DS	
CS	MOU
CS	MOU
UN	
SU	

RAYMOND_QUARRY

DS	GTU
DS	GTU
UN	
DS	
DS	MOU
DS	MOU
CS	MOU
DS	MOU
CS	
UN	
CS	
DS	GTU
CS	
CS	ROT
UN	
CS	
CS	EYE
CS	
DS	MOU
CS	GTU
CS	GTI
CS	
DS	GTU
CS	
DS	
CS	
DS	
SU	
DS	GTU
SU	
SU	
CS	ROT
SU	
DS	GTU
DS	
DS	
DS	GTU
DS	
CS	MOU
CS	MOU
DS	MOU
UN	
DS	GTU
CS	MOU
DS	ROT
CS	MOU
CS	GTU
SU	
DS	
DS	MOU

RAYMOND_QUARRY

DS	
CS	MOU
UN	MOU
DS	
DS	MOU
UN	
DS	
CS	
CS	
DS	GTU
UN	
UN	
CS	
SU	
CS	ROT
CS	
DS	GTU
DS	
CS	
CS	
SU	
DS	
DS	GTU
CS	
CS	
UN	MOU
DS	GTU
UN	
CS	
DS	ROT
UN	
DS	GTU
CS	
CS	
DS	
DS	
CS	GTU
SU	
SU	ROT
DS	
DS	GTU
SU	
DS	GTU
SU	
CS	
CS	MOU
DS	GTU
CS	MOU
CS	MOU
UN	

RAYMOND_QUARRY

DS	JUV
CS	ROT
CS	MOU
CS	ROT
UN	
UN	
CS	MOU
SU	
CS	
CS	GTU
UN	ROT
UN	
CS	
SU	
DS	MOU
SU	
CS	ROT
DS	ROT
CS	
DS	GTU
DS	GTU
SU	
DS	
DS	MOU
CS	GTU
CS	
CS	
SU	
CS	MOU
CS	GTI
CS	
DS	
DS	MOU
CS	
CS	MOU
SU	
CS	
CS	MOU
CS	MOU
CS	
SU	
CS	MOU
UN	
SU	
CS	GTU
CS	
DS	
DS	
SU	

RAYMOND_QUARRY

CS	MOU
DS	
CS	
CS	MOU
CS	MOU
CS	MOU
DS	
CS	MOU
CS	
DS	MOU
DS	
DS	GTU
CS	
CS	
DS	MOU
CS	
DS	GTU
CS	MOU
CS	
DS	
DS	MOU
CS	
CS	
CS	EYE
DS	
SU	PYR
DS	MOU
CS	MOU
DS	ROT
DS	
UN	
DS	
UN	
CS	PRE
SU	
CS	
UN	
DS	ROT
SU	
DS	JUV
CS	
DS	
DS	GTU
CS	
CS	
CS	MOU
DS	
UN	
UN	MOU
SU	
CS	JUV

RAYMOND_QUARRY

CS	MOU
CS	
DS	ROT
SU	
CS	
DS	GTU
SU	
CS	
DS	GTU
CS	MOU
UN	
UN	MOU
DS	ROT
CS	
CS	MOU
CS	MOU
SU	
SU	
DS	GTU
DS	
SU	
DS	
CS	MOU
CS	
CS	
SU	
CS	
CS	
CS	
CS	MOU
DS	
CS	
UN	MOU
DS	GTU
UN	
CS	
DS	
SU	
SU	
DS	GTU
SU	
SU	
SU	
CS	
CS	
SU	
CS	
DS	
CS	
DS	GTU
SU	
DS	GTU

RAYMOND_QUARRY

DS	GTU
CS	ROT
SU	ATT
UN	MOU
UN	MOU
DS	
DS	JUV
UN	
SU	
CS	
SU	
CS	MOU
DS	GTU
CS	
UN	
DS	GTU
SU	
CS	MOU
DS	MOU
DS	
SU	
CS	EYE
UN	
CS	EYE
DS	
DS	GTU
DS	GTU
DS	MOU
CS	
UN	MOU
DS	GTU
UN	
CS	MOU
SU	
DS	
DS	GTU
CS	
SU	
UN	
CS	
UN	
CS	MOU
DS	
DS	MOU
DS	MOU
DS	GTU
SU	
CS	MOU
UN	
UN	MOU
CS	

RAYMOND_QUARRY

CS	
CS	
CS	
CS	MOU
UN	
CS	MOU
CS	
CS	
DS	GTU
DS	MOU
DS	GTU
DS	GTU
DS	
CS	
DS	GTU
UN	
SU	
DS	GTU
CS	MOU
CS	MOU
CS	ROT
SU	
CS	PRE
SU	
SU	
DS	GTU
CS	
UN	
SU	
SU	
DS	MOU
SU	
SU	
CS	
SU	
SU	
DS	
DS	
CS	
DS	GTU
SU	
DS	
DS	GTU
CS	
UN	
DS	
DS	GTU
DS	
SU	SOF
CS	MOU
DS	
SU	

RAYMOND_QUARRY

DS	GTU
UN	
UN	
CS	EYE
DS	GTU
CS	EYE
CS	
DS	
CS	
CS	MOU
CS	
CS	
DS	
DS	
CS	MOU
UN	MOU
DS	
CS	
DS	GTU
DS	
DS	GTU
CS	
CS	
UN	
UN	
SU	
CS	
DS	GTU
CS	MOU
CS	ROT
SU	
CS	
CS	
SU	ROT
SU	
CS	MOU
DS	MOU
CS	MOU
CS	
CS	
DS	APP
CS	
CS	MOU
DS	MOU
DS	
SU	
SU	
CS	
SU	
CS	MOU
SU	

RAYMOND_QUARRY

CS	
SU	
UN	MOU
SU	
CS	
SU	
UN	MOU
DS	GTU
DS	
CS	
UN	
DS	GTU
DS	
CS	
DS	GTU
SU	
DS	
DS	
DS	GTU
SU	
CS	
DS	GTU
DS	JUV
UN	
DS	GTU]
SU	
DS	PRE
CS	ROT
DS	
CS	MOU
DS	
DS	GTU
DS	GTU
DS	
DS	GTU
SU	
SU	
DS	GTU
DS	
DS	GTU
DS	MOU
CS	
DS	GTU
DS	
CS	
DS	GTU
CS	
SU	BAS
SU	
CS	

RAYMOND_QUARRY

SU	
SU	
CS	MOU
SU	
DS	GTU
DS	GTU
UN	MOU
SU	
SU	
CS	GTU
CS	MOU
CS	MOU
SU	
UN	
DS	ROT
DS	
CS	
CS	MOU
UN	
DS	
SU	
SU	
SU	
CS	
CS	MOU
CS	MOU
UN	ROT
DS	
SU	
DS	ROT
DS	ROT
SU	
CS	
DS	
UN	
CS	ROT
CS	
DS	ROT
DS	
SU	
CS	
DS	GTU
DS	PRE
DS	GTU
DS	
DS	GTU
UN	
CS	GTU
UN	
DS	APP

RAYMOND_QUARRY

SU	
CS	MOU
SU	
CS	GTU
CS	MOU
CS	
SU	
SU	
CS	MOU
CS	MOU
DS	GTU
SU	BAS
SU	
SU	
SU	BAS
SU	
SU	
CS	
DS	
UN	
DS	GTU
SU	
SU	
CS	
DS	
CS	MOU
DS	GTU
CS	GTU
CS	
DS	
DS	ROT
CS	GTU
UN	MOU
UN	MOU
UN	
SU	
SU	
SU	
SU	
UN	
CS	
UN	
SU	
CS	MOU
UN	
CS	
DS	MOU
SU	
DS	
DS	

RAYMOND_QUARRY

DS	ROT
CS	
CS	MOU
SU	
CS	MOU
CS	
SU	
DS	GTU
CS	
DS	
SU	
CS	
DS	GTU
DS	
UN	
UN	MOU
DS	
CS	MOU
CS	ROT
CS	MOU
SU	SOF
CS	MOU
CS	MOU
DS	ROT
DS	ROT
SU	
CS	MOU
CS	
CS	ROT
CS	
DS	GTU
CS	
DS	GTU
UN	
CS	EYE
UN	MOU
CS	
DS	
UN	
DS	
DS	
CS	MOU
DS	
CS	
DS	GTU
DS	
CS	
SU	
SU	
DS	GTU
DS	ROT

RAYMOND_QUARRY

DS	GTU
CS	MOU
CS	MOU
SU	
SU	
CS	MOU
SU	
CS	MOU
CS	
SU	

DS	MOU
SU	
UN	
DS	MOU
SU	
UN	
DS	
DS	GTU
CS	
DS	
CS	ROT
CS	ROT
CS	
DS	
SU	
SU	
CS	ROT
CS	
CS	MOU
DS	ROT
CS	MOU
SU	
SU	
DS	
CS	MOU
CS	MOU
CS	EYE
DS	ROT
DS	MOU
SU	
SU	
SU	
UN	
CS	MOU
DS	ROT
DS	GTU
DS	
UN	
SU	
SU	

RAYMOND_QUARRY

CS	MOU
DS	GTU
SU	
DS	GTU
CS	
CS	
UN	
UN	
SU	
SU	
CS	MOU
CS	MOU
UN	MOU
DS	MOU
CS	
CS	
CS	
CS	MOU
SU	
DS	GTU
DS	
CS	MOU
DS	GTU
UN	
UN	
CS	MOU
DS	
CS	GTU
UN	
PH	
CS	MOU
DS	ROT
CS	
CS	MOU
CS	MOU
SU	
CS	
DS	
CS	GTI
SU	PRE
DS	GTU
SU	BAS
SU	
CS	MOU
SU	
DS	
SU	
SU	
CS	
SU	

RAYMOND_QUARRY

SU	
SU	
DS	
SU	
CS	
SU	
SU	
CS	ROT
DS	GTU
UN	
SU	
DS	GTU
CS	
DS	
UN	
CS	
CS	MOU
DS	GTU
DS	GTU
CS	GTU
CS	
CS	
DS	MOU
SU	
SU	
SU	
CS	
CS	MOU
CS	MOU
SU	
UN	
CS	ROT
SU	
DS	
CS	MOU
UN	MOU
CS	
CS	MOU
DS	
CS	
CS	
UN	
UN	MOU
CS	MOU
DS	GTU
DS	GTU
SU	
CS	GTI
DS	PRE
DS	PRE

RAYMOND_QUARRY

CS	
SU	
DS	
DS	
CS	
DS	
SU	
UN	
CS	MOU
CS	MOU
UN	MOU
CS	
CS	
DS	
CS	MOU
CS	GTI
SU	PRE
CS	
DS	PRE
DS	
DS	GTU
SU	
PH	
SU	
	PYR
UN	WOR
CS	
DS	MOU
SU	
SU	ATT
SU	
DS	GTU
DS	ROT
UN	
CS	
CS	
DS	MOU
CS	
SU	
CS	ROT
DS	
SU	
UN	
CS	
DS	GTU
SU	
CS	
SU	
SU	
DS	GTU

RAYMOND_QUARRY

SU	ATT
DS	MOU
CS	
DS	GTU
CS	
DS	GTU
CS	GTU
CS	
UN	MOU
SU	
CS	GTI
DS	PRE
CS	MOU
CS	
UN	
CS	
DS	
CS	
CS	MOU
DS	GTU
DS	GTU
DS	
CS	
UN	
PH	
UN	
CS	
CS	
DS	ROT
DS	GTU
SU	
UN	
CS	
CS	
DS	GTU
DS	
UN	
CS	
UN	
DS	GTU
UN	
DS	GTU
UN	
CS	MOU
SU	
CS	MOU
CS	
DS	GTU
DS	
DS	GTU

RAYMOND_QUARRY

CS	GTU
SU	
UN	
CS	
UN	
CS	
UN	MOU
CS	
DS	
UN	MOU
CS	MOU
CS	
CS	MOU
SU	
CS	MOU
CS	
CS	MOU
UN	
DS	
DS	GTU
UN	
CS	MOU
DS	SOF
DS	
CS	
CS	
UN	MOU
CS	MOU
DS	MOU
SU	
DS	GTU
DS	GTU
CS	MOU
SU	
CS	MOU
UN	
SU	
CS	
SU	
CS	MOU
CS	MOU
SU	
DS	
DS	
CS	MOU
DS	

RAYMOND_QUARRY

CS	MOU
UN	MOU
CS	MOU
CS	
CS	
SU	
CS	MOU
CS	
DS	
CS	
UN	
CS	
DS	JUV
DS	
CS	ROT
CS	MOU
UN	
CS	
CS	MOU
CS	ROT
DS	
CS	MOU
SU	
DS	
DS	
CS	MOU
UN	
CS	MOU
CS	MOU
CS	
CS	
SU	
DS	MOU
CS	PRE
SU	
CS	
DS	GTU
CS	GTU
SU	
CS	
CS	
SU	
CS	GTU
SU	
UN	MOU
SU	
CS	
CS	MOU
CS	ROT

RAYMOND_QUARRY

CS	MOU
DS	SOF
SU	
CS	MOU
CS	
SU	
CS	MOU
UN	
DS	
DS	GTU
DS	
SU	BAS
SU	
DS	GTU
CS	GTI
SU	PRE
DS	ROT
CS	MOU
CS	
CS	
CS	
CS	
UN	
CS	MOU
CS	
SU	
CS	
DS	
SU	
CS	
SU	
SU	
CS	MOU
PH	
SU	
CS	
DS	
CS	MOU
CS	
SU	
CS	MOU
UN	MOU
UN	
SU	

RAYMOND_QUARRY

DS	
SU	
CS	MOU
UN	
CS	MOU
DS	GTU
SU	SOF
DS	GTU
DS	
SU	
UN	
CS	
DS	ROT
DS	GTU
UN	
UN	
SU	ATT
UN	
CS	MOU
SU	
UN	
CS	MOU
DS	
SU	
UN	MOU
CS	MOU
CS	MOU
CS	
CS	MOU
SU	
DS	SOF
DS	MOU
DS	
UN	
CS	MOU
CS	
DS	
DS	
SU	
SU	
DS	
DS	
UN	MOU
CS	MOU
SU	
SU	
CS	GTI

RAYMOND_QUARRY

DS	PRE
UN	MOU
DS	ROT
DS	
SU	
CS	GTU
SU	
CS	MOU
CS	MOU
CS	
SU	BAS
DS	
SU	
UN	
SU	
DS	
SU	
DS	GTU
DS	
SU	
CS	GTI
DS	PRE
DS	MOU
CS	MOU
CS	
UN	
SU	
DS	
CS	GTU
CS	MOU
DS	GTU
SU	
CS	MOU
CS	MOU
CS	MOU
DS	
CS	
CS	MOU
SU	BAS
SU	
CS	MOU
SU	
SU	
CS	
SU	BAS
SU	
SU	
UN	MOU
CS	
CS	MOU
CS	

RAYMOND_QUARRY

CS	MOU
UN	
DS	
DS	GTU
UN	MOU
DS	GTU
DS	GTU
UN	
UN	MOU
DS	JUV
UN	MOU
UN	
CS	ROT
CS	
DS	MOU
CS	
DS	GTU
DS	
CS	MOU
CS	
CS	MOU
SU	
DS	
UN	
CS	MOU
UN	
CS	MOU
PH	
CS	
DS	GTU
SU	PYR
CS	MOU
CS	MOU
CS	MOU
SU	
CS	
CS	MOU
SU	
DS	
UN	
SU	
SU	
CS	MOU
DS	GTU
CS	MOU
UN	MOU
DS	GTU
CS	
SU	
DS	MOU
CS	

RAYMOND_QUARRY

UN	
DS	
CS	
DS	GTU
DS	PRE
DS	ROT
DS	
DS	GTU
DS	
DS	PRE
CS	MOU
SU	
CS	
SU	
CS	
CS	MOU
UN	PRE
CS	ROT
CS	
SU	
UN	WOR
UN	
CS	MOU
DS	
SU	
CS	GTU
CS	GTI
DS	PRE
CS	
DS	GTU
DS	
DS	MOU
CS	MOU
UN	
CS	ROT
DS	
UN	
CS	
DS	GTU
DS	
UN	MOU
DS	GTU
CS	MOU
CS	ROT
DS	
SU	
DS	
UN	
CS	
CS	

RAYMOND_QUARRY

SU	
CS	MOU
UN	
DS	
DS	
SU	
DS	MOU
DS	
PH	
DS	
CS	
CS	
SU	
CS	MOU
DS	GTU
UN	PRE
CS	MOU
SU	
SU	ATT
SU	ATT
SU	ATT
SU	
SU	
SU	
CS	
SU	BAS
SU	
CS	MOU
DS	GTU
CS	ROT
CS	
CS	ROT
DS	
UN	MOU
SU	
UN	
CS	MOU
SU	
CS	MOU
CS	MOU
CS	MOU
DS	GTU
CS	MOU
CS	
CS	
DS	
SU	
CS	
CS	
DS	

RAYMOND_QUARRY

CS	
DS	
DS	GTU
DS	
CS	GTU
SU	
CS	ROT
DS	ROT
CS	GTU
UN	
DS	
SU	
DS	GTU
SU	
CS	GTU
DS	GTU
CS	MOU
CS	ROT
DS	
CS	
DS	
SU	
CS	MOU
CS	
CS	MOU
CS	
CS	GTU
CS	EYE
DS	
DS	GTU
DS	PRE
SU	
DS	GTU
CS	
DS	
DS	
CS	MOU
CS	MOU
DS	GTU
CS	
CS	
DS	
CS	
DS	
CS	GTU
CS	MOU
CS	MOU
SU	
CS	MOU
CS	MOU
DS	MOU

RAYMOND_QUARRY

SU	
CS	MOU
DS	GTU
UN	
DS	GTU
DS	GTU
CS	MOU
SU	
CS	MOU
CS	MOU
CS	MOU
DS	
CS	
CS	PYR
CS	
UN	PYR
UN	ROT
DS	
DS	
CS	
SU	
DS	MOU
SU	
UN	
CS	MOU
CS	MOU
DS	MOU
DS	GTU
DS	
SU	
DS	GTU
UN	MOU
UN	
CS	MOU
CS	
CS	MOU
SU	
DS	
DS	SOF
DS	SOF
DS	
CS	
UN	
CS	
SU	
DS	MOU
UN	
SU	
DS	GTU
CS	

RAYMOND_QUARRY

CS	MOU
CS	
CS	GTU
DS	GTU
CS	MOU
DS	
DS	
CS	ROT
DS	
CS	
SU	
SU	SOF
DS	GTU
DS	SOF
DS	ROT
DS	
CS	MOU
DS	
DS	SOF
DS	
CS	MOU
UN	
DS	
DS	
DS	PYR
CS	
CS	ROT
DS	
CS	MOU
CS	MOU
UN	
UN	ROT
CS	
UN	MOU
SU	
CS	MOU
DS	GTU
DS	GTU
SU	PYR
SU	
DS	
CS	
DS	ROT
UN	
DS	
CS	MOU
CS	
CS	MOU
DS	ROT
CS	MOU

RAYMOND_QUARRY

CS	
CS	MOU
DS	GTU
DS	MOU
CS	
CS	
DS	
DS	ROT
DS	GTU
DS	
CS	PRE
CS	MOU
CS	
UN	
DS	ROT
DS	
CS	
CS	
SU	
CS	
CS	MOU
DS	
CS	
CS	MOU
DS	GTU
SU	
DS	
CS	MOU
CS	MOU
CS	
SU	
SU	
DS	
SU	
DS	
CS	
DS	GTU
CS	
SU	
SU	
DS	
DS	GTU
DS	PRE
CS	MOU
CS	
DS	GTU
DS	PYR
UN	MOU
DS	GTU
CS	
DS	PRE

RAYMOND_QUARRY

CS	MOU
DS	GTU
CS	
SU	
SU	
SU	
CS	MOU
UN	
CS	
DS	MOU
UN	
DS	GTU
UN	
UN	ROT
DS	
DS	
CS	
DS	GTU
SU	BAS
SU	
SU	
CS	MOU
DS	GTU
DS	
DS	GTU
CS	
DS	
DS	
CS	
CS	MOU
CS	MOU
DS	
DS	
DS	
CS	MOU
CS	MOU
CS	
SU	
SU	
CS	EYE
UN	
DS	
CS	MOU
DS	GTU
UN	MOU
CS	
CS	
CS	MOU
CS	
UN	MOU

RAYMOND_QUARRY

DS	GTU
DS	GTU
CS	
DS	GTU
DS	GTU
DS	
DS	MOU
CS	MOU
DS	
CS	MOU
CS	MOU
SU	
SU	
CS	MOU
DS	GTU
UN	
CS	MOU
UN	MOU
DS	
DS	
CS	MOU
CS	MOU
CS	
CS	
CS	
DS	
UN	MOU
CS	
SU	
CS	
DS	GTU
DS	GTU
CS	
SU	
DS	MOU
CS	MOU
SU	
CS	GTU
CS	
DS	GTU
CS	MOU
CS	ROT
CS	
CS	
CS	
CS	
SU	
SU	
CS	MOU
CS	MOU
DS	GTU

RAYMOND_QUARRY

DS	
DS	
UN	ROT
CS	MOU
CS	MOU
DS	
CS	
CS	
SU	
DS	
DS	
SU	
DS	GTU
DS	MOU
DS	GTU
CS	MOU
CS	MOU
DS	
CS	MOU
DS	GTU
DS	GTU
CS	
DS	
CS	
CS	MOU
UN	MOU
UN	
SU	
CS	
SU	ROT
DS	
DS	
UN	
SU	
CS	GTU
DS	
CS	MOU
CS	
CS	MOU
SU	
CS	
SU	
DS	
CS	MOU
SU	
DS	ROT
CS	MOU
CS	MOU]
CS	MOU
SU	
SU	

RAYMOND_QUARRY

SU	
CS	GTU
DS	
CS	
DS	GTU
CS	
UN	MOU
DS	
DS	GTU
DS	
UN	MOU
SU	BAS
SU	JUV
CS	
CS	ROT
SU	
CS	MOU
CS	
CS	
DS	GTU
UN	MOU
DS	
DS	MOU
CS	
UN	
SU	
DS	PRE
CS	
DS	GTU
CS	
CS	MOU
SU	
CS	MOU
CS	
CS	
CS	
CS	ROT
CS	
DS	
DS	
SU	
UN	
UN	
DS	GTU
DS	
CS	
UN	MOU
CS	MOU
CS	

RAYMOND_QUARRY

SU	
DS	MOU
DS	
CS	
CS	
CS	GTI
DS	PRE
DS	PRE
DS	PRE
DS	
DS	JUV
DS	GTU
SU	
SU	
CS	GLU
DS	
SU	MOU
CS	MOU
DS	
DS	GTU
CS	
CS	EYE
CS	MOU
CS	MOU
SU	
UN	MOU
CS	ROT
DS	
CS	ROT
UN	MOU
DS	GTU
DS	
DS	GTU
CS	MOU
UN	
DS	MOU
CS	ROT
SU	
SU	
DS	GTU
CS	
DS	GTU
CS	ROT
DS	
CS	
DS	GTU
DS	GTU
DS	
DS	
CS	MOU

RAYMOND_QUARRY

DS	GTU
SU	SOF
DS	MOU
CS	
DS	MOU
SU	
CS	MOU
UN	
DS	
DS	
SU	
SU	
PH	
CS	
CS	
UN	
DS	GTU
SU	
DS	GTU
UN	
CS	
DS	GTU
DS	ROT
DS	
SU	JUV
CS	MOU
DS	GTU
DS	
UN	
DS	GTU
DS	
CS	GTU
SU	
DS	
DS	
CS	MOU
UN	MOU
CS	MOU
SU	
CS	MOU
CS	MOU
UN	
CS	MOU
CS	GTU
UN	
DS	
DS	GTU
DS	
DS	
CS	ROT
CS	MOU

RAYMOND_QUARRY

CS	EYE
DS	GTU
DS	GTU
DS	ROT
CS	GTU
SU	
DS	
CS	
CS	MOU
DS	GTU
SU	
DS	
DS	
UN	
UN	
SU	
SU	
DS	GTU
DS	GTU
DS	GTU
DS	
DS	GTU
CS	
CS	GTU
SU	PYR
DS	GTU
CS	
SU	
UN	
CS	
CS	
DS	GTU
SU	
DS	JUV
CS	
DS	
DS	
CS	MOU
UN	
CS	GTU
DS	
DS	
CS	
DS	GTU
CS	
CS	
CS	
UN	
CS	
CS	MOU
SU	

RAYMOND_QUARRY

DS	
CS	MOU
UN	
CS	MOU
DS	GTU
DS	
CS	
UN	
CS	MOU
CS	MOU
CS	
SU	
SU	BAS
DS	
DS	MOU
CS	
SU	
CS	MOU
CS	MOU
SU	
DS	
CS	ROT
DS	GTU
UN	
DS	GTU
CS	MOU
CS	
DS	
DS	GTU
DS	GTU
CS	MOU
DS	GTU
DS	PRE
CS	
CS	
CS	
UN	
CS	MOU
CS	MOU
UN	
DS	MOU
CS	ROT
SU	
DS	MOU
CS	MOU
CS	MOU
CS	
CS	
CS	MOU

RAYMOND_QUARRY

SU	
DS	
SU	
SU	
DS	GTU
CS	
CS	
SU	
SU	
DS	
DS	MOU
DS	
DS	MOU
SU	
CS	
CS	MOU
CS	MOU
DS	GTU
SU	
SU	
DS	ROT
UN	MOU
SU	
DS	
UN	
CS	
UN	
DS	GTU
DS	
SU	
SU	
CS	
CS	MOU
DS	GTU
UN	
DS	
UN	WOR
UN	
DS	
SU	
SU	
DS	
DS	GTU
DS	GTU
DS	GTU
CS	GTU
CS	
DS	
UN	MOU
SU	
SU	

RAYMOND_QUARRY

SU	
SU	
SU	
DS	
CS	GTU
DS	GTU
CS	ROT
CS	MOU
DS	MOU
CS	GTU
DS	
DS	
DS	
UN	
CS	MOU
CS	
SU	
SU	BAS
SU	ROT
UN	ROT
CS	MOU
CS	MOU
CS	GTU
DS	
CS	MOU
CS	
DS	GTU
CS	
PH	
CS	GTU
CS	
SU	
CS	
SU	
DS	
DS	
UN	WOR
UN	
DS	
UN	
DS	GTU
CS	
UN	MOU
DS	
SU	
DS	GTU
CS	
SU	
CS	EYE

RAYMOND_QUARRY

CS	EYE
CS	EYE
CS	EYE
CS	
CS	EYE
CS	EYE
DS	
CS	EYE
CS	EYE
CS	
CS	EYE
CS	EYE
CS	EYE
UN	
UN	
UN	
CS	
CS	MOU
CS	MOU
CS	MOU
DS	
DS	
DS	
DS	
UN	
DS	
DS	
DS	
UN	
DS	
UN	
UN	
UN	
UN	
UN	
UN	
DS	
DS	
CS	ROT
CS	
DS	MOU
CS	ROT
SU	
SU	
DS	SOF
UN	
UN	CTE
UN	WOR
DS	
CS	

RAYMOND_QUARRY

[illegible]

RAYMOND_QUARRY

UN	
DS	
UN	
SU	
UN	WOR
UN	
DS	
UN	
UN	WOR
UN	
DS	
UN	WOR
UN	
DS	
UN	WOR
UN	
DS	
UN	WOR
CS	
SU	
UN	WOR
UN	
DS	
UN	WOR
UN	
DS	
UN	WOR
UN	
DS	
UN	WOR
UN	
DS	
UN	WOR
UN	
DS	
UN	
CS	ROT
CS	ROT
CS	
CS	ROT
CS	
CS	ROT
CS	ROT
CS	
CS	MOU
SU	
CS	ROT
CS	ROT
CS	ROT
CS	ROT
CS	ROT

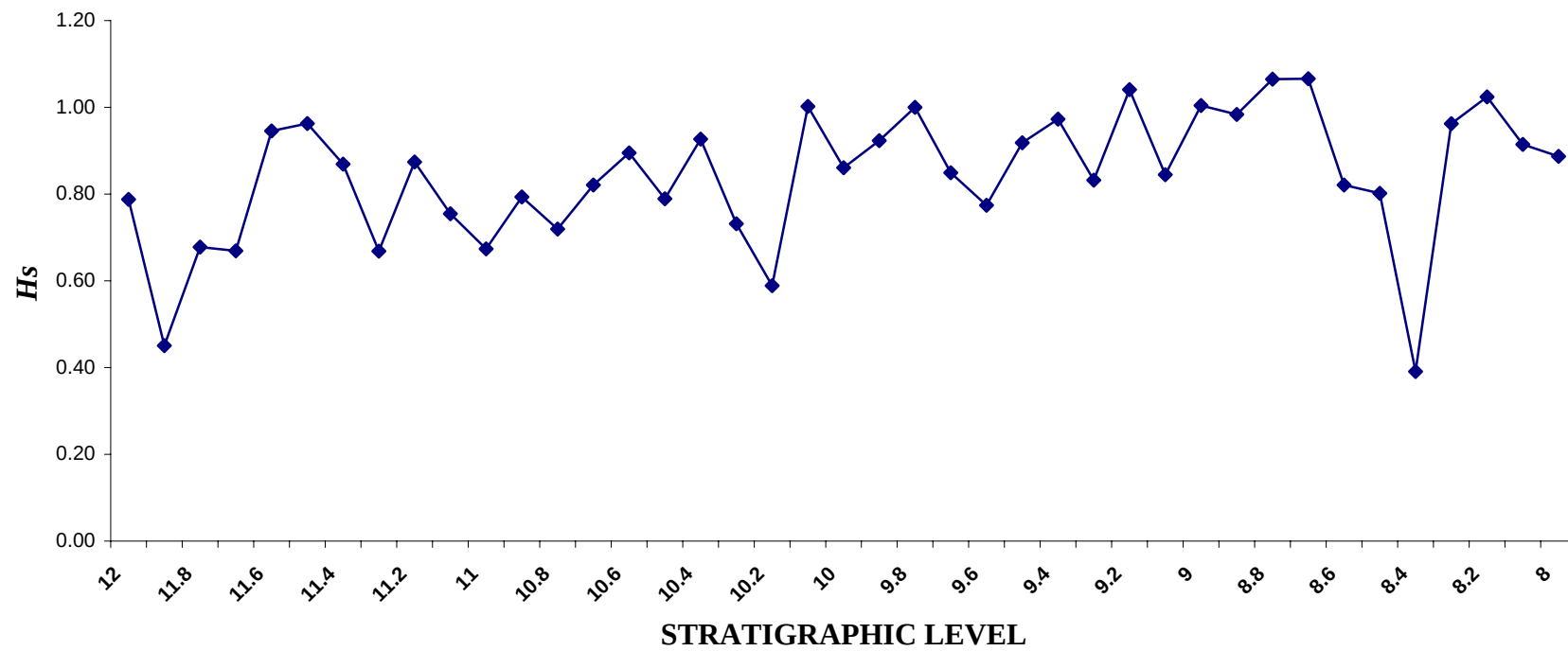
RAYMOND_QUARRY

CS	ROT
CS	ROT
CS	ROT
SU	SOF
CS	ROT
SU	
CS	ROT
CS	
CS	
UN	
CS	
CS	
CS	ROT
CS	
CS	ROT
SU	
SU	
CS	ROT
CS	ROT
CS	
CS	ROT
SU	
SU	
SU	
SU	
CS	GTI
SU	PRE
SU	
SU	
SU	
SU	
SU	
SU	
SU	
SU	
SU	
SU	
SU	
SU	
CS	MOU
SU	
SU	
SU	
UN	
SU	
SU	
SU	

RAYMOND_QUARRY

SU	
SU	
SU	
SU	
SU	
SU	
SU	
SU	
SU	
SU	
SU	
SU	
SU	
SU	
SU	
SU	
SU	
CS	
SU	
SU	
SU	
SU	
SU	
SU	
SU	
SU	
CS	ROT
CS	
CS	
SU	
SU	
SU	
DS	PRE
DS	PRE

Relative diversity (H_s)



Sidneyia

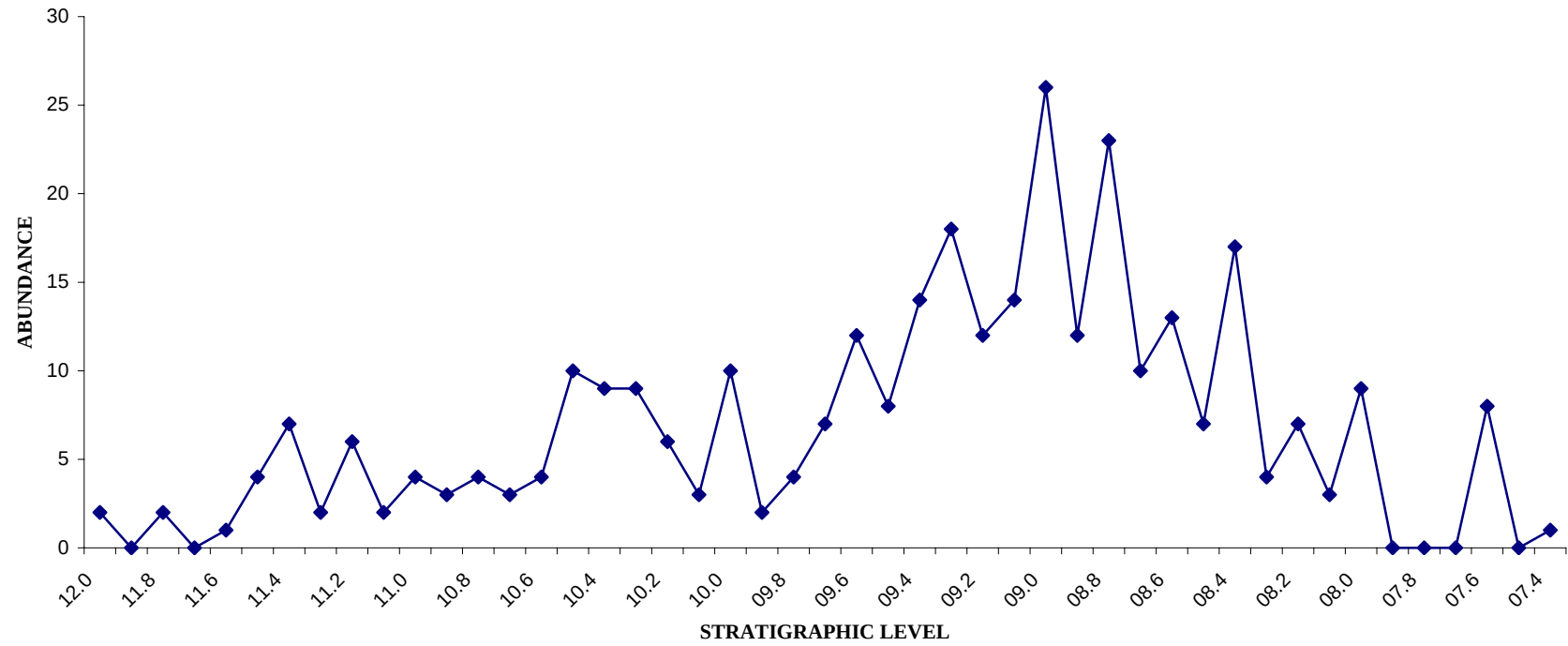


TABLE 3

Distribution of the known, broadly defined life habits of Raymond Quarry organisms. Nekto-benthic habits are considered 'epifaunal' vagrant in this context. Because of the large number of fossil organisms which have unknown habits, all numbers below represent minimum values.

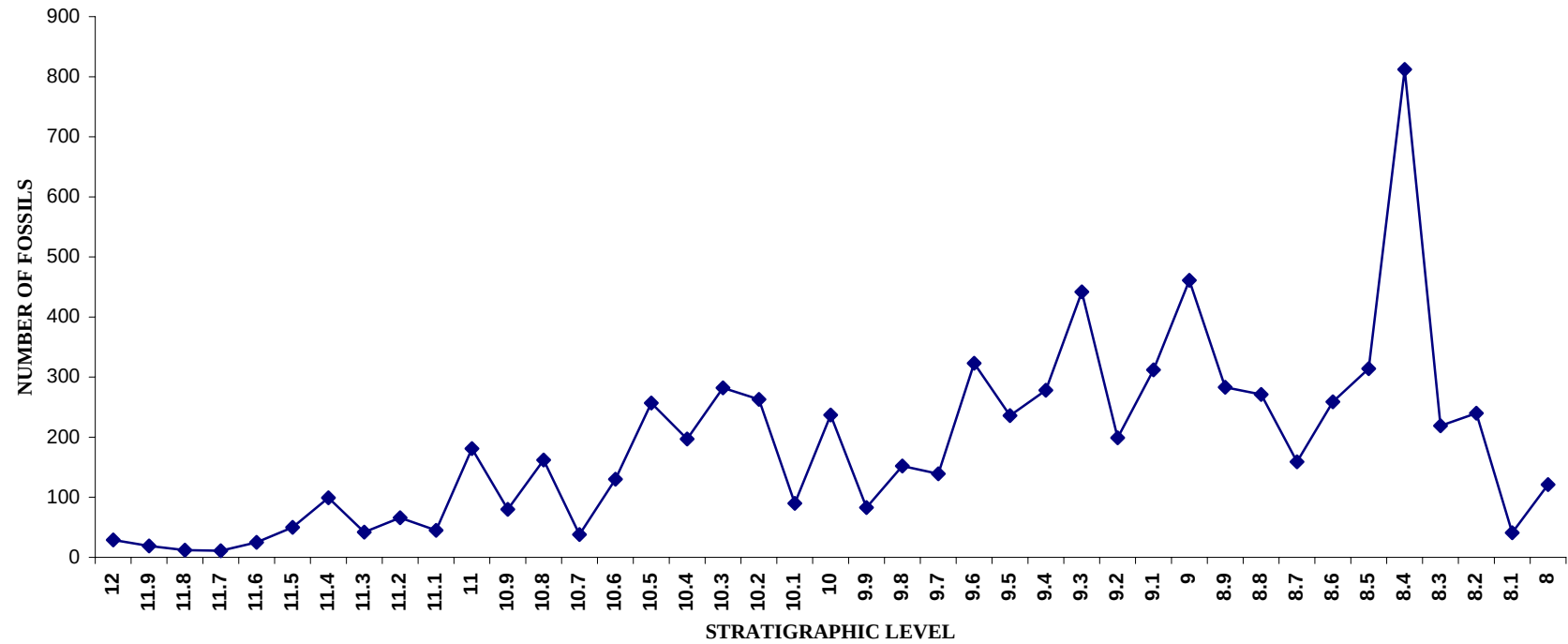
HABIT	TOTAL NUMBER	% OF FAUNA
infaunal vagrant	1588	21.0
epifaunal sessile	2582	34.2
epifaunal vagrant	1389	18.4
pelagic	506	6.7

TABLE 4.

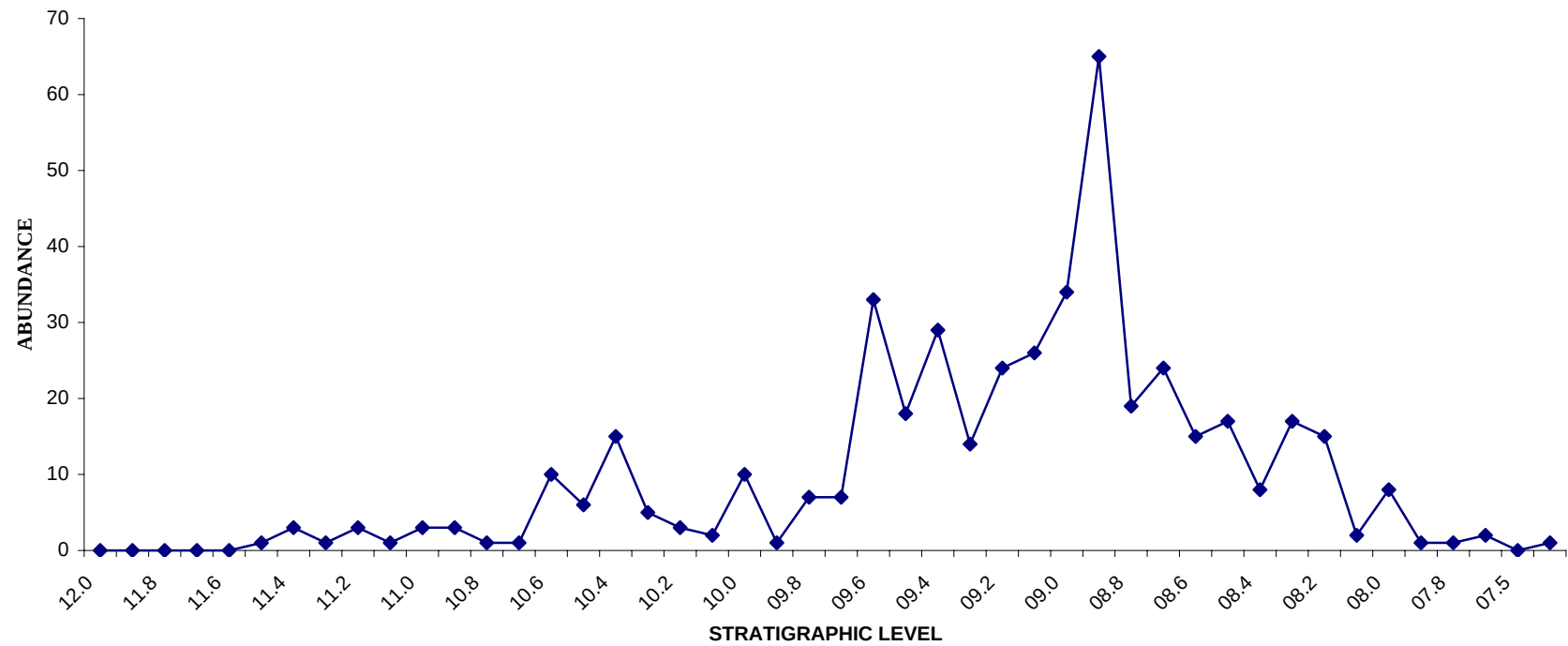
Concordance by rank-order between numerical abundance and total estimated biovolume of taxa comprising the Raymond Quarry trophic nucleus. Rank is determined within broadly defined trophic categories. The inclusion of *Pollingeria* with the primary consumers is purely hypothetical.

PRIMARY CONSUMERS	NUMBER OF INDIVIDUALS (RANK)	TOTAL BIOVOLUME cm³ (RANK/ CHANGE)
<i>Choia</i>	1434 (1)	63 (5/ -4)
<i>Pollingeria</i> ?	1135 (2)	1783 (2/ 0)
<i>Vauxia</i>	476 (3)	935 (3/ 0)
chancelloriids	297 (4)	4374 (1/ +3)
<i>Priscansermarinus</i>	132 (5)	209 (4/ +1)
<i>Pagetia</i>	114 (6)	4 (6/ 0)
 PRIMARY CARNIVORES		
<i>Ottoia</i>	1584 (1)	44786 (1/ 0)
<i>Leancoilia</i>	1062 (2)	26019 (2/ 0)
<i>Sidneyia</i>	204 (3)	11475 (3/ 0)
 SECONDARY (+?) CARNIVORES		
undescribed medusoids	104 (1)	66162 (1/ 0)
<i>Hurdia</i>	74 (2)	9687 (2/ 0)

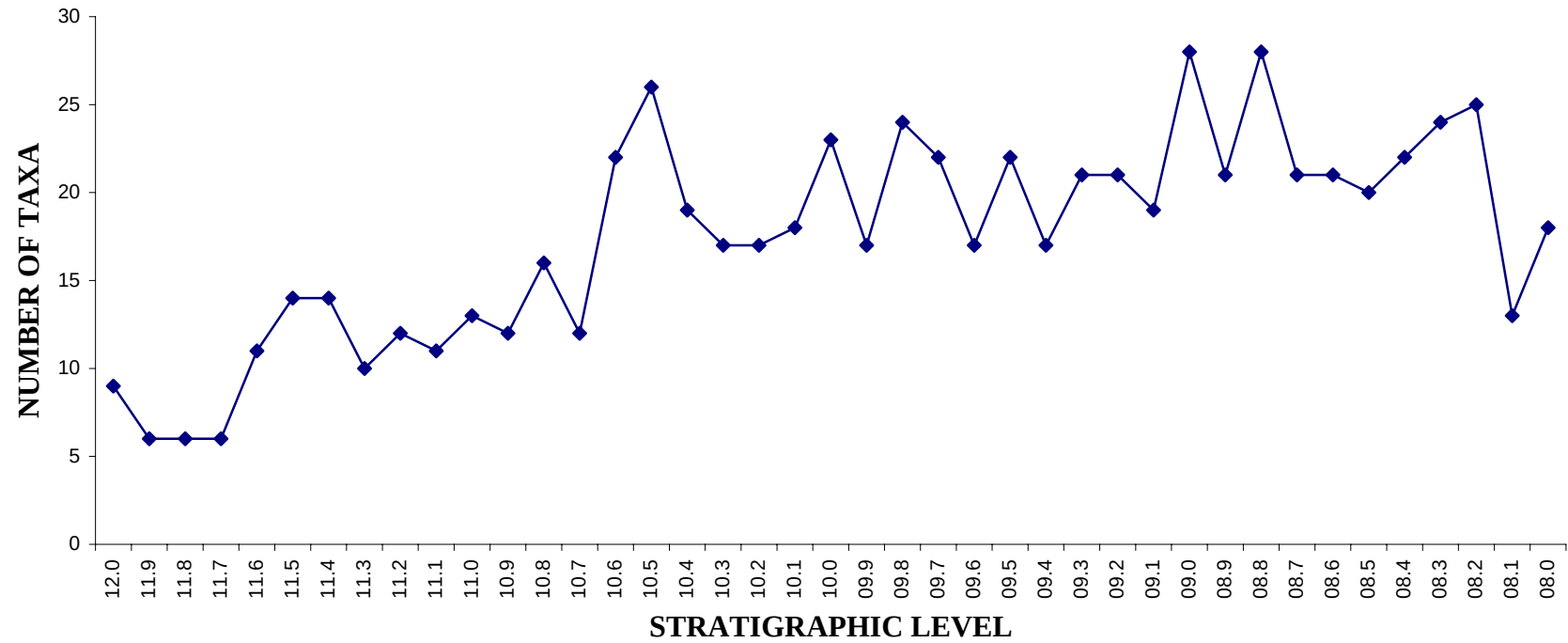
Total fossils



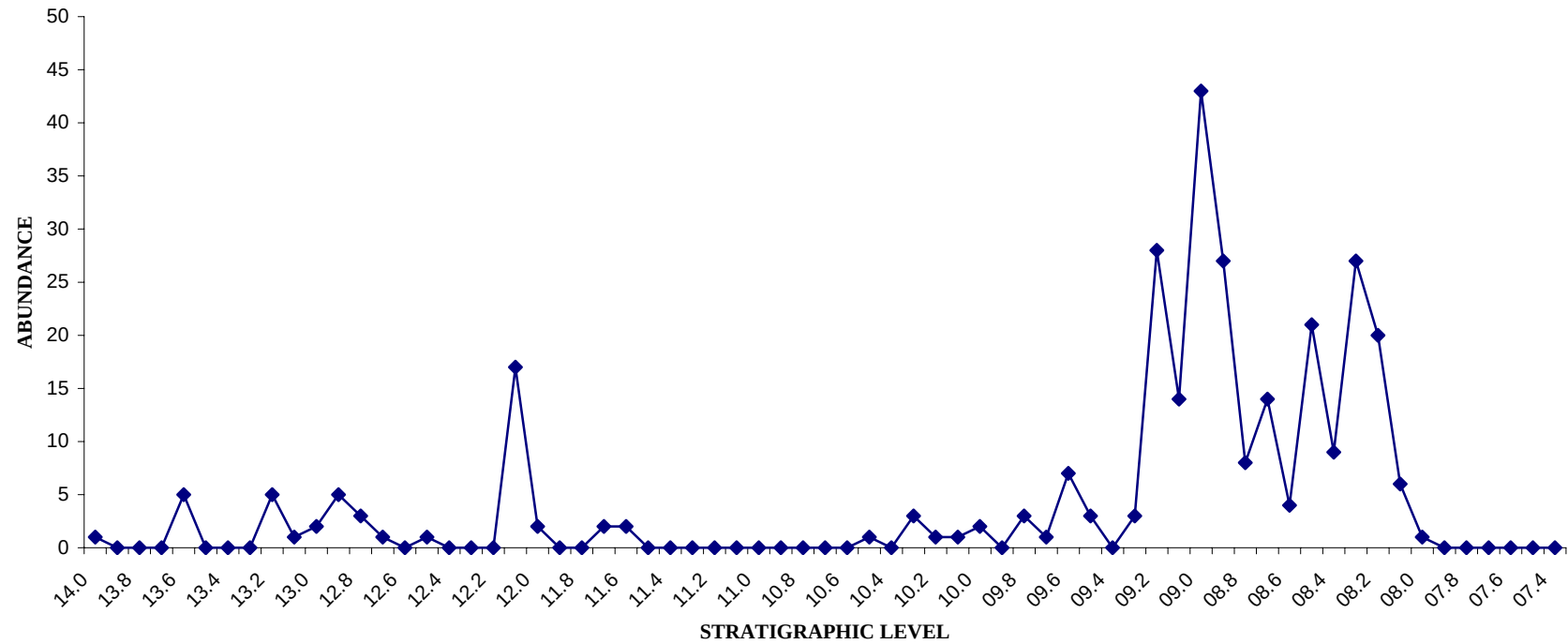
Vauxia



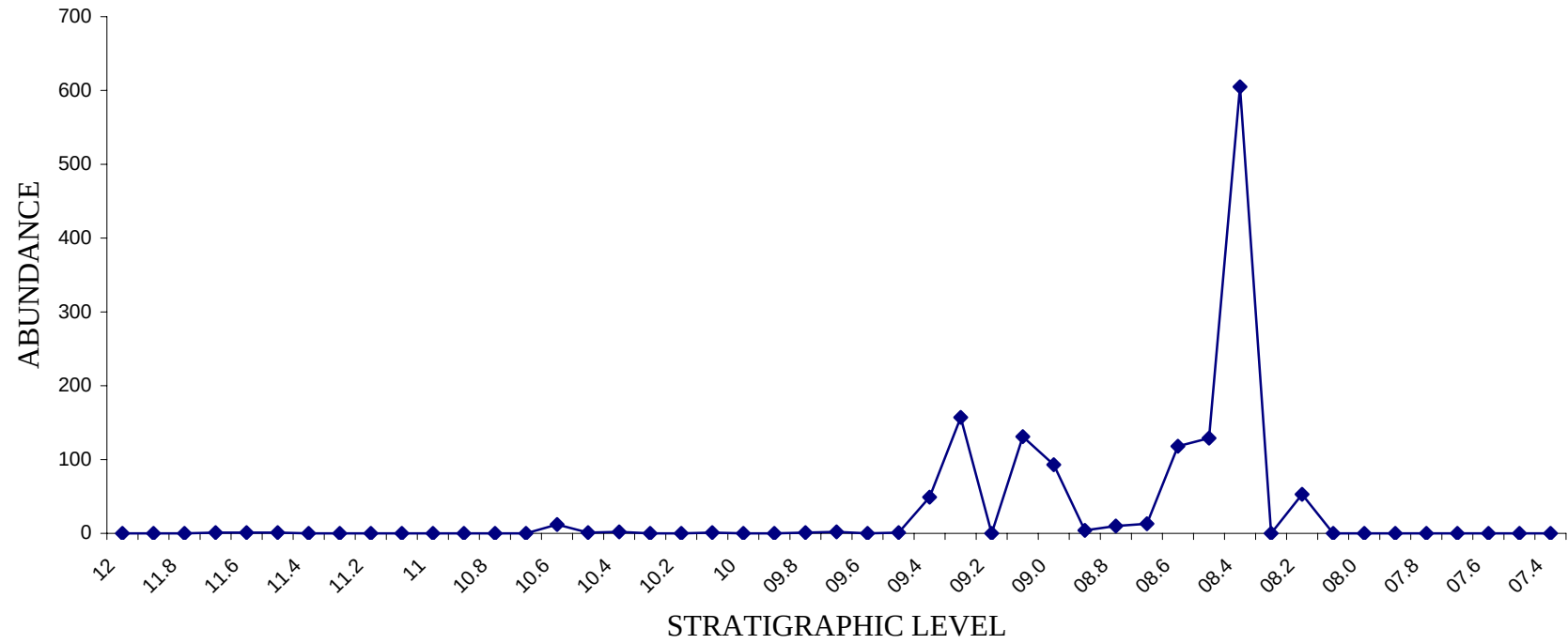
Absolute diversity (T)



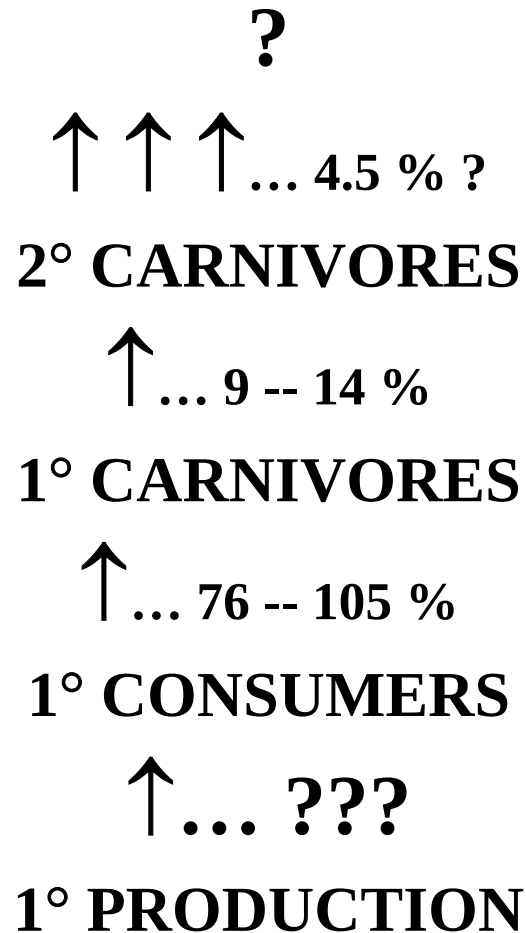
chancelloriids



Choia



Estimates of energy/nutrient transfer between trophic levels



Hurdia

