

Hectares BC

Requirements Specification

Prepared For

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Document Tracking

Version: 3
Last Updated: Sept 5, 2007



REVISION HISTORY

Date	Version	Author	Description of Changes
Aug 31, 2007	3	Anne Downton (Refractions Research)	Insert User Stories
Aug 24, 2007	2	Sue Fox (Refractions Research)	Updates to Performance Requirements, Security Requirements and Interoperability Requirements sections based on input from Working Group
Jul 30, 2007	1	Sue Fox (Refractions Research)	First draft

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1 INTRODUCTION

1.1 PURPOSE

The purpose of this document is to describe the functional and non-functional requirements for the Hectares BC system. This document will be used as a basis for finalizing the requirements and design for the system.

The intended audience for this document includes:

- Project Manager, Matt Austin
- Members of the Hectares BC Working Group
- Refractions Development Team

1.2 SCOPE

The following items are in scope for this project (commencing May 15, 2007 and ending June 27, 2008):

- The ability to handle user supplied formulas for extracting data and the ability to specify areas of interest;
- Build metadata input and reporting capabilities;
- Build Canadian Geospatial Data Infrastructure (CGDI) data-access mechanisms, making the data and the system available to researchers, administrators, planners and the public;
- Provide a web interface for generating summary metrics from the system;
- Provide outputs in various format including GeoTIFF and KML;
- Add a large representative population of climate, topography, watershed, wetland, local government, land use, ground cover and ecosystem layers;
- Add existing CGDI data layers;
- Provide a link to the LRDW, the BC Digital Road Atlas, and the BC Corporate Watershed Base, all of which will be used as data sources; and
- Provide a link from Hectares BC to a species distribution modeling tool.

The following items are out of scope and provided here to help clarify the scope boundaries of the project:

- Manipulating raw data into a form suitable for upload into Hectares BC; and
- Addressing data quality issues.

1.3 ACTORS

This document will utilize user stories, which detail the functional requirements of the Hectares BC system. The following users have been identified and may be referred to in the user stories. As many of the users listed below have access to the same functionality and will be requesting similar information from the system, most users stories will not list the individual users; instead, they will maintain the generic term, 'user'. Users of the system include:

- Environment and natural resource decision makers:
 - planners
 - data custodians/data stewards
 - decision-makers/policy makers
 - government agencies
 - industry consultants
 - non-government organizations
 - First Nations
 - other stakeholders
- Ecological modelers
- General Public
- Administrator
- Product Owner

1.4 REFERENCES

The following sources were used as references in the creation of this requirements specification:

- Hectares BC Project Charter
<http://habc.refractions.net/wiki/fields/habc/index.php?n=PM.ProjectDocuments>
- Hectares BC Systems and Architecture Documentation (currently in progress)
(<http://habc.refractions.net/wiki/fields/habc/index.php?n=PM.ProjectDocuments>)
- Ministry of Agriculture and Lands, Information Management Branch's (IMB) Analysis and Requirements Specifications template, dated May 15, 2007
(http://srmwww.gov.bc.ca/imb/3star/sdlc/3analysis/Analysis_Reqmts_Specs.doc)
- Hectares BC Project Wiki
(<http://habc.refractions.net/wiki/fields/habc/index.php>)

1.5 OVERVIEW OF DOCUMENT

This document describes the requirements for Hectares BC. The System Overview section provides a summary of the system including background on previous phases and project constraints. The Business Process Model section illustrates the current process flow for GIS analysis and how Hectares BC improves this process flow. The Requirements section describes both the functional and non-functional requirements for the system.

2 SYSTEM OVERVIEW

2.1 PROJECT PERSPECTIVE

Two prior phases of the project have been completed for the Conservation Planning Tools Committee of the BC Trust for Public Lands. Phase 1 was completed in August 2006. The goal of this phase was to minimize risk in subsequent phases by testing the feasibility of the project, provide a design to guide the following phase, and ensure that all the software components exist and function well enough to carry out the processing.

Phase 2 was completed in March 2007. Phase 2 involved creating a system for processing the data using the designs and tools investigated during Phase 1. It also included the processing of various data layers identified as important for supporting the immediate ecological planning needs of the client.

2.2 SYSTEM CONTEXT

The British Columbia provincial government has a wealth of geospatial data but limited staff and tools for its analysis. Many government agencies, non-government organizations, First Nations groups, researchers and other associations, including the general public are involved in a range of planning, assessment, reporting and decision-making functions pertaining to the environmental and natural resources of British Columbia. Traditional processes for producing this information have been project-based: raw data are assembled from multiple sources; an overlay with the analysis units is carried out; metrics are calculated; a report is written; and the data are filed and forgotten. When new geographic areas are of interest or different attributes or metrics are required, the entire project process is repeated.

This process is time-consuming and inefficient due to the repeated effort each time a new requirement for data is identified. Data produced from these projects are not necessarily consistent as it is collected from different sources. Additionally, accessibility to information is limited to a subset of users as some technical expertise is required to obtain the information.

Construction of a collaborative environmental analysis system will allow users to share access to common data, provide easy access to their own data, generate summaries of environmental statistics for study areas, and combine information from different disciplines in a straightforward non-technical manner.

Hectares BC is a project to prototype a new tool for geospatial data analysis in the natural resource area. The project divides the Province into 95 million one-hectare cells and calculates key metrics of human impact and environmental conditions (e.g. length of road, forest characteristics, climate, projected climate change, known species habitat) for each cell.

The goal of Hectares BC is to improve access to summarized, integrated geospatial data for a wide range of clients and to deliver timely, consistent responses to clients with minimum intervention by geomatics professionals. It also aims to provide an analytical framework that is faster and more flexible for repeated analyses than what is currently available to advanced users of geospatial data outside of government.

Users of Hectares BC will be able to submit queries and get tabular responses and raster maps as outputs. These outputs may constitute the final results or may instead be passed into other tools, such as specialized analysis routines, statistical packages, image analysis systems and geographic information systems.

The specific applications that Hectares BC will focus on are:

- Species at risk decision-making;
- Biodiversity status report and action plan;
- Species distribution and habitat supply modelling;
- State of Environment reporting;
- Forest inventory statistics, including State for Forests reporting;
- Hydrological modelling;
- Mountain pine beetle decision support;
- Replacing Watersheds Statistics database for decision support; and
- Future forest ecosystems.

Hectares BC is effectively an extension of the Land and Resource Data Warehouse (LRDW) and relies upon it as a source for many of its inputs and associated metadata. Hectares BC serves the purpose of the LRDW by further integrating geospatial data and facilitating its use.

Figure 1 shows a high-level context diagram for the system.

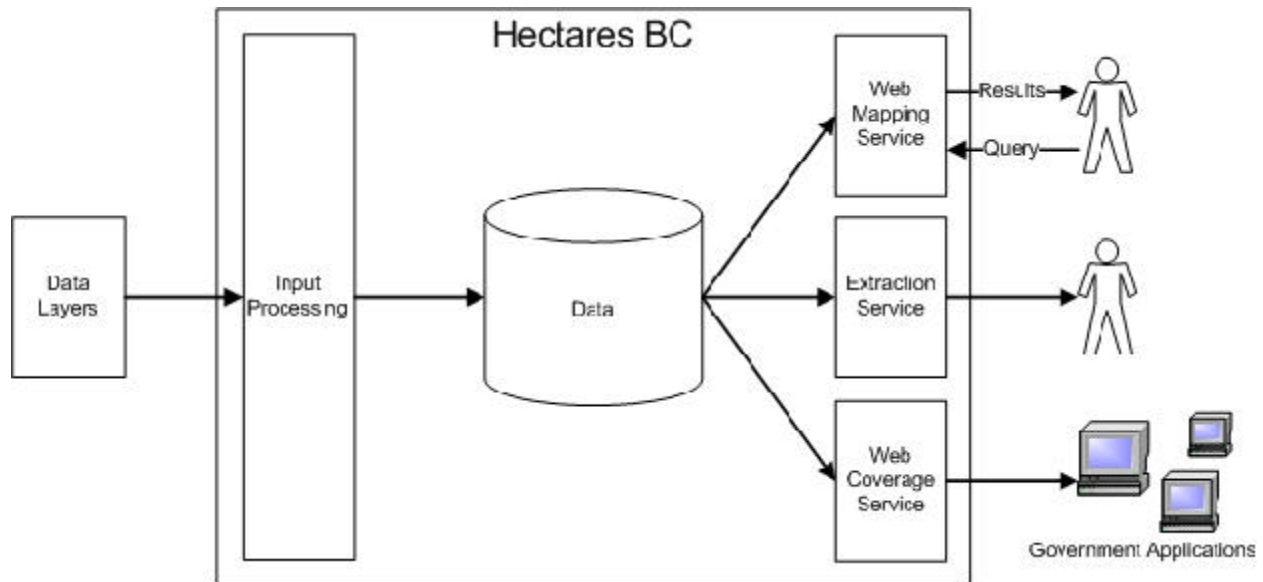


Figure 1: System Context Diagram

2.3 GENERAL CONSTRAINTS

The following is a list of potential issues or constraints that could have an impact on the success of the project:

- The system will be managing a very large amount of data, and performance may be compromised. Performance testing will be conducted throughout the project to ensure any issues are addressed as early as possible.
- Funding may not be available to maintain Hectares BC after the pilot project is complete. This risk will be managed by focusing the development of the project on meeting the needs of users and data custodians with as low an ongoing cost as possible. Building Hectares BC outside government with a broad array of partners will also minimize the cost to government.
- Limited access to stakeholders for the duration of the project, especially those stakeholders that are not part of the Steering Committee.
- Unable to acquire spatial data from data custodians in a timely manner that does not impact the time line of the project.
- Spatial data received from stakeholder does not comply with the requirements of the system causing delays.
- Broad initial conception of the system will need to be pared down into a design that is achievable within the project budget.
- The project will use technology that is not standard to the provincial government.

2.4 ASSUMPTIONS AND DEPENDENCIES

- The requirements in this document will be fully reviewed by the client stakeholders. Feedback must be received in a timely manner.
- All spatial data received from stakeholder or data custodians will comply with the format required for loading into the Hectares BC system. Data manipulation is not within the scope of this project.

3 BUSINESS PROCESS MODEL

Traditional processes for producing geospatial information have been project based: raw data are assembled from multiple sources; an overlay with the analysis unit(s) is carried out; metrics are calculated and a report is written. When new geographic areas are of interest, or different attributes or metrics are required, the entire project process is often repeated, as shown in Figure 2.

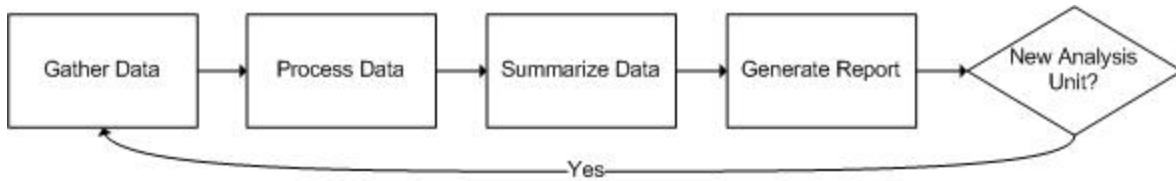


Figure 2: Current Process Flow for GIS Analyses

Hectares BC will allow multiple environmental analysts to share information about resource information in British Columbia, prepare summaries of that information, and extract the raw information for use in complex modelling routines. If a new analysis unit or metric is required, it is just a matter of re-querying the existing data as shown in Figure 3.

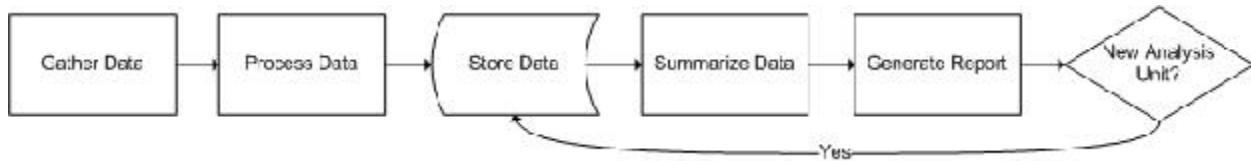


Figure 3: Hectares BC Process Flow

4 REQUIREMENTS

4.1 FUNCTIONAL REQUIREMENTS

The Functional Requirements section includes a list of user stories that have resulted from the requirements analysis. A user story is a high level system requirements outlining how a user performs an action on the application. The story includes all relevant discussions and decisions about the requirements, and includes acceptance tests that identify how users will verify that the requirement has been met to their satisfaction.

It is important to note that user stories evolve during the analysis, design and implementation phases. The user stories included in this document are current as of the date the document was last updated.

4.1.1 Definitions

Land Characterization – Also know as Show Me Where ... queries. This functionality allows to ask spatial questions which are then summarized for every hectare of land in BC. The results of the “*show me where...*” questions are displayed on a map of the province.

Summary – Also known as How Much ... queries. This functionality allows user to summarize data in the HaBC system.

4.1.2 User Stories

4.1.2.1 Login Functionality

4.1.2.1.1 As a user, I want to log into the Hectares BC system because I want to save Land Characterizations and Summaries, to view my batch processing list, and view existing Land Characterizations and Summaries.

4.1.2.1.2 As a user, I want to be required to provide only an email address to create a Hectares BC account. My name and organization should be optional.

4.1.2.1.3 As a user, I want to run Land Characterizations and Summaries without having to login.

4.1.2.2 Administrator Functionality

4.1.2.2.1 As an administrator, I want to view items in the batch processing queue.

- 4.1.2.2.2 As an administrator, I want to add a new spatial data layer.
- 4.1.2.2.3 As an administrator, I want to know what kinds of questions users are asking of the Hectares BC system, regardless of whether the Land Characterizations and Summaries are being saved.
- 4.1.2.2.4 As an administrator, I want to be able to delete items from the batch processing queue.
- 4.1.2.2.5 As an administrator, I want to be able to specify the order the data layers appear in the layer list.
- 4.1.2.2.6 As an administrator, I want to view all items that have ever been entered into the batch queue as well as which is most popular.
- 4.1.2.2.7 As an administrator, I want to be able to see what keywords users have used in the search functions.
- 4.1.2.2.8 As an administrator, I want to know what the most popular geographic areas are when users are creating Land Characterizations

4.1.2.3 Help Functionality

- 4.1.2.3.1 As a user, I want to view a tutorial about how to create a Summary.
- 4.1.2.3.2 As a user, I want to view a tutorial about how to create a Land Characterization.
- 4.1.2.3.3 As a user, I want to select a help button at anytime throughout the creation of a Land Characterization.
- 4.1.2.3.4 As a user, I want select a help button at anytime throughout the creation of a Summary.
- 4.1.2.3.5 As a user, I want to access a help button from the HaBC tab.
- 4.1.2.3.6 As a user, I want to see tool tips that will help make the Hectares BC system easier to use.
- 4.1.2.3.7 As a user, I want to know what the thematic symbols mean that represent the value or categorical types of spatial layers.

4.1.2.4 Raw Data Accessibility

- 4.1.2.4.1 As a user, I want to access the raw raster data via a WMS or WCS service.
- 4.1.2.4.2 As a user, I want to view raw raster data layers in Google Earth.
- 4.1.2.4.3 As a user, I want to download a raw raster data layer because I want to create an image (formats include TIFF and ASCII grid)
- 4.1.2.4.4 As a user, I want to view a map of a raw raster layer.

4.1.2.5 Land Characterization Functionality

- 4.1.2.5.1 As a user, I want to select an existing land characterization from the layer list and see that the metadata includes land characterization name, data created, and formula.
- 4.1.2.5.2 As a user, I want to see a preview of the image to be exported when exporting a land characterization.
- 4.1.2.5.3 As a user, I want confirmation my land characterization has been saved.
- 4.1.2.5.4 As a user, I want to be able to build land characterizations from other land characterizations I have created.
- 4.1.2.5.5 As a user, I want to be able to pull a layer over to the definition window more than once.
- 4.1.2.5.6 As a user, I want to see the units of the layer with the layer name in the land characterization definition box when dragging value based layers (ex. Road Length (km)).
- 4.1.2.5.7 As a user, I want to be able to view my land characterization in Google Earth.
- 4.1.2.5.8 As a user, I want to be able to define a limit for value based layers when creating land characterizations (ex. < 3)
- 4.1.2.5.9 As a user, I want to be able to define a layer joining precedence when building land characterizations.
- 4.1.2.5.10 As a user, I want to be able to select “not” when selecting a categorical layer for building a land characterization.

- 4.1.2.5.11 As a user, I want to be able to drag a layer or category into the land characterization definition box so I can build up my land characterization query.
- 4.1.2.5.12 As a user, I want to be able to select between 'AND' and 'OR' for combining layers when building land characterization queries.
- 4.1.2.5.13 As a user, I want the data layers to be differentiated thematically in the layer list so I can tell the difference between category and value layers.
- 4.1.2.5.14 As a user, I want to export my land characterizations as a jpg, at maximum (1ha) resolution.
- 4.1.2.5.15 As a user, I want to view metadata for each layer category, including any related links.
- 4.1.2.5.16 As a user, I want to view metadata for a spatial data layer as well as any related links.
- 4.1.2.5.17 As a user, I want to save a land characterization because I can use it again in the future, view it in Google Earth, use it in a summary, or use it another other land characterization.
- 4.1.2.5.18 As a user, I want to search for a spatial data layer (category, or value) using all or part of a word and have the search results replace the layer list.
- 4.1.2.5.19 As a user, I want to view a map (in low resolution) that shows me the results of my land characterization without having to wait for the results to be emailed to me.
- 4.1.2.5.20 As a user, I want the land characterization map to have a default basemap that includes major BC features so I can better locate my areas of interest.
- 4.1.2.5.21 As a user I want to zoom in and out (and pan around) the map to change the resolution or view my results in greater detail.
- 4.1.2.5.22 As a user, I want to add a title to my land characterization so that I can save it for future use.
- 4.1.2.5.23 As a user, I want to select a previously saved land characterization and view those results.
- 4.1.2.5.24 As a user I want to clear the search box because I want to start over.

4.1.2.6 Summarization Functionality

- 4.1.2.6.1 As a user, I want to see a list of data layers available to me.

- 4.1.2.6.2 As a user, I want to be able to save my Summary.
- 4.1.2.6.3 As a user, I want to receive confirmation that my Summary has been saved.
- 4.1.2.6.4 As a user, I want to export my Summary.
- 4.1.2.6.5 As a user, I want to send my Summary to multiple email addresses.
- 4.1.2.6.6 As a user, I want to be able to view the results of summary in approximate values so that I may see my results within 10 seconds.
- 4.1.2.6.7 As a user, I want to be able to select a resolution which indicates the precision of data used in the Summary (two choices: lower resolution with faster processing time and less accurate, and higher resolution with a slower processing time and accurate).
- 4.1.2.6.8 As a user, I want to save a Summary without being logged in (the system should prompt me for a login or allow me to create a new login account).
- 4.1.2.6.9 As a user, I want to see my saved Land Characterization(s) in the list of layers and be able to drag and drop them into the Summary.
- 4.1.2.6.10As a user, I want to clear the search window so that I can start another search.
- 4.1.2.6.11As a user, I want to be able to drag value layers into the Summary table.
- 4.1.2.6.12As a user, I want to see the column and row headers updated when I drag layers into the Summary table.
- 4.1.2.6.13As a user, I want to be able to drag and drop category layers into either the rows or columns of the summary grid.
- 4.1.2.6.14As a user, I want the data layers to be differentiated thematically in the layer list so I can tell the difference between category and value layers.
- 4.1.2.6.15As a user, I want to see the metadata for the layers classes as well as any related links.
- 4.1.2.6.16As a user, I want to see the metadata for a data layer as well as any related links.
- 4.1.2.6.17As a user, I want to be able to specify a title for my summary so I can come back to it at a later date or add it to the batch processing queue.
- 4.1.2.6.18As a user, I want to select an existing summary from my saved summaries because I want to add to it.

- 4.1.2.6.19 As a user, I want to see a warning when the summary results shown are not computed on the full 1 ha grid.
- 4.1.2.6.20 As a user, I want to see well defined drop areas for category and value data layers.
- 4.1.2.6.21 As a user, when I select an existing land characterization from the layer list (to use in summary) I want the metadata to show the land characterization: name, date created, and formula.
- 4.1.2.6.22 As a user, I want to search the list of data layers using a keyword search.
- 4.1.2.6.23 As a Product Owner, I want the summarized results to be rounded when displaying results that are not computed from the 1ha grid.

4.1.2.7 My HaBC Functionality

- 4.1.2.7.1 As a user, I want to change/update my personal information.
- 4.1.2.7.2 As a user, I want to see the following information in 'my summaries':
- Name
 - Date Created
 - Formula
 - Edit buttons for each entry
- 4.1.2.7.3 As a user, I want to be able to delete a saved Land Characterization.
- 4.1.2.7.4 As a user, I want to be able to delete a saved Summary.
- 4.1.2.7.5 As a user, I want to be able to delete items I have sent to the queue.
- 4.1.2.7.6 As a user, I want to see (under myLandCharacterizations):
- Name
 - Date Created
 - Formula
 - Edit buttons for each entry

4.1.2.7.7 As a user, I was to see (under myHaBC):

- All saved Land Characterizations
- All saved Summaries
- All items in the batch queue
- My personal information (name, organization, email)

4.1.2.7.8 As a user, I want to see (in the batch queue):

- Status
- Format
- Submitted date
- Queue order
- Summary name
- Completed date
- Email (to where results have been sent)

4.1.2.7.9 As a user, I want to be able to click on the 'edit...' button in the summary list and have it take me to the Land Characterization page and have the formula populated.

4.1.2.7.10 As a user, I want to be able to click on the 'edit...' button in the summary list and have it take me to the Summary page and have the formula populated.

4.1.2.7.11 As a user, I want to be able to see all items that I have submitted into the batch queue, including items that are completed, in process, and ready.

4.1.2.7.12 As a user, I want to be able to resend the results of the batch process to an email address or multiple email addresses.

4.2 NON-FUNCTIONAL REQUIREMENTS

4.2.1 Usability Requirements

The target user for Hectares BC is someone with no GIS experience. They may have some experience using an application such as Google™ Maps, but nothing more sophisticated.

The target user is someone who is comfortable enough with computers and web browsers to purchase an airline ticket online.

4.2.2 Performance Requirements

This section describes the performance requirements for Hectares BC with respect to response time, precision, reliability and availability.

There are two aspects to response time requirements: response time for real-time queries and response time for batch queries. For real-time queries, a response should be returned to the user in less than a second. This response may not represent an actual answer to the query, but it should at least provide the user with an indication that the system has accepted their query. For batch queries, response time will depend on the actual query. Provincial summarizations should be returned in less than two hours.

User interface transitions (for example: page reloads and alterations in user interface state) should never take more than one second.

For precision, the accuracy of the data is entirely dependent on the data that is provided to the system. Hectares BC does not make any claims on accuracy of data, except to ensure that any mathematical computations performed on the provided data are correct.

For reliability and availability, it is expected that the system will be available 24/7, with exceptions for scheduled maintenance and unforeseen system failures.

4.2.3 Security Requirements

There are no security requirements for data access as the data provided to Hectares BC will all be available for public consumption (the vast majority is already accessible but in a form that limits its use).

The system will not be susceptible to malicious use as queries will be placed in a priority queue, and performed in a predetermined order. In addition, administrators will have the ability to remove jobs from the queue if necessary.

There will be a security component for data managers that will allow a subset of users to load data, manage the priority queue and purge the queue.

4.2.4 Legal Requirements

The source of all datasets must be identified in the metadata for the dataset.

Hectares BC accepts no liability for decisions made based on the data extracted from the system, nor does it make any claims on the accuracy of the data supplied to the system.

4.2.5 Interoperability Requirements

Hectares BC will provide tabular results in the following formats:

- CSV
- Shapefile

Hectares BC will provide mapped results in the following formats:

- GeoTIFF
- ArcGrid (ASCII format)

In future phases, Hectares BC may also provide mapped results in the following formats:

- GRASS Grid
- R Grid

Hectares BC will provide integration with standard government applications through a Web Coverage Service (WCS) standard interface.

Hectares BC will provide a Web Map Service (WMS) interface per the Canadian Geospatial Data Infrastructure standards.

4.2.6 Scalability Requirements

For data loading and queries, the system should scale sub-linearly as the number of datasets increases. For example, if the number of datasets goes from five to ten, the time spent to run a query should not double after the datasets are added. The goal will be for constant time – a query will take a predetermined amount of time to run regardless of the number of datasets loaded into the database.

There is no limit to the number of users who can access the system at one time; however, performance requirements as listed in the previous section *Performance Requirements* will be met when there are no more than two simultaneous users.

4.2.7 User Interface Requirements

User interface requirements are provided the supporting documentation *User Interface Design*.