24 April 2017

Mr Stuart Mosely
Deputy Director-General, Planning Group
DILGP
1 William Street
Brisbane QLD 4000

Dear Stuart,

BUILDING INFORMATION MODELLING – DRAFT POLICY AND PRINCIPLES FOR QUEENSLAND

Thank you for the opportunity for the Institute of Public Works Engineering Australasia, Queensland (IPWEAQ) to make a submission on the proposed policy and principles for the adoption of BIM for infrastructure projects across Queensland.

IPWEAQ is the peak body representing those working in the public works sector in Queensland. Our purpose is to enhance the quality of life for all Queensland communities by advancing the skills, knowledge and resources available to those involved in the planning and provision of public works and services. Our membership primarily comprises of engineers.

We have developed a number of key sector products and publications including Standard Drawings, Complete Streets (urban street design), Lower Order Road Design Guidelines (LORDG) and our non-proprietary schema, ADAC (Asset Design as Constructed).

Developed in conjunction with local governments, ADAC is a strategic solution offering government and utilities significant savings in time and money. The Bundaberg Regional Council implementation of ADAC has resulted in a reduction to planning approvals from five days to 20 minutes. ADAC is freely available to councils however implementation usually requires the assistance of one of our authorised providers.

We believe there is enormous potential for ADAC to complement BIM enhancing the efficiencies, value proposition and productivity in the delivery and management of infrastructure assets for Queensland. As the peak body for the sector, we would be delighted to work collaboratively with the Queensland government to achieve this goal.

Information on ADAC is provided with this submission however we would be pleased to have our Director, Technical Products, Ross Guppy deliver a presentation to you on ADAC.

Yours faithfully,

Leigh Cunningham
Chief Executive Officer
Origins of ADAC

ADAC was a collaborative effort between three adjoining councils on Queensland’s Sunshine Coast in 2006. These councils were experiencing significant growth in urban development and were becoming increasingly challenged with the management of donated infrastructure submitted using inconsistent standards and formats. Their goal was to develop a robust framework for the efficient and standardised capture, delivery and use of public works asset data.

The project has continued to grow in scale and maturity and now involves a number of Queensland councils plus councils and utilities from other states. The growing awareness of the ADAC experience across Australia offers an opportunity for the Queensland government to capitalise on the work of the institute over the past decade to enhance the benefits expected from the adoption of BIM. The two products working in conjunction will offer a superior system of asset management for Queensland for inevitable adoption in other states.

Our vision is that ADAC will become the industry standard for describing civil infrastructure asset design and as constructed data across a range of public and private asset classes.

What is ADAC?

1. ADAC is a standard data transfer format (XML), not a software solution. It is comprised of three components: Data Standard, data transfer mechanism and supporting documentation. The standard data specification has been developed by asset management practitioners and it sets out both the spatial and non-spatial data (attributes) requirements for the supported asset classes. Data for GIS and asset registers are simultaneously imported to guarantee consistency.

2. ADAC is a set of tools that make the exchange of standardised asset information easier between asset designers, constructors and owners. With the increasing take-up of the ADAC process, major commercial providers of survey, design, GIS and asset management systems now provide ADAC configurations ‘out of the box’.

3. ADAC defines the information required by local government at the time of plan sealing, when the works constructed by developers must be approved and the donated assets incorporated in local government asset systems. It supports the internal (capital) works of local government allowing the as-constructed information from that process to be uploaded into asset management and GIS systems. This information is supplied electronica providing automated upload.

4. ADAC supports the efficient transfer of ‘as-constructed’ asset information from the land development industry to councils and vice versa. The process is designed to capture detailed data on new civil infrastructure assets including water, sewerage, drainage, roads, bridges and open space as well as survey-accurate cadastral information.

5. ADAC offers substantial benefits to all stakeholders involved in the project life cycle and specifically those involved in the ‘as constructed’ process chain. Consultants for land developers who are responsible for preparing ‘as con’ plans and providing asset information on new urban developments, now have a consistent approach when recording this information and supplying it to any ADAC participating councils.

6. The ADAC specification is endorsed by the National Asset Management Strategy (NAMS) and is the only data specification referenced in the International Infrastructure Management Manual (IIMM)
ADAC Transforms Business

Councils are responsible for the planning and management of a broad range of public assets including roads, footpaths, stormwater systems, parks etc. In some states, councils may also be responsible for the planning and management of public water and sewerage systems.

The vast majority of these assets are donated to councils via the land development process. Councils, even those with low to moderate levels of growth, can potentially receive millions of dollars of new assets annually. Areas with large industry growth have adopted and benefited from the adoption of ADAC, for example the Gladstone Regional Council.

As the long-term custodians, councils are required to accurately record and value the new assets, capturing and maintaining all relevant information. They are then expected to continue to manage and rehabilitate these assets in the most cost-effective way into the future.

Historically, hardcopy ‘as constructed’ plans are submitted to local authorities at the completion of each major stage of a development. The collection of asset data on this new civil infrastructure is then actioned through scrutiny of the supplied plans. This approach is recognised as both time consuming and potentially prone to human errors.

The ADAC process allows for all relevant details associated with the donated assets to be captured accurately and consistently in an electronic manner. The capture process is undertaken according to a predefined asset data model during creation of the ‘as constructed’ plans. The information is provided to councils in digital form and can be used to create relevant GIS layers and support the automated population of other backend systems such as asset management databases.

The digital format enables rapid valuation of assets and computerised checking of the supplied information against any predefined business rules, saving time and money. The information can then be used in the development of necessary operations, maintenance and renewal plans along with cash flows identified for budgeting forecasts. The ADAC process can also be applied to internal capital works where the scale of works or expenditure thresholds necessitates the provision of ‘as constructed’ information.

The ADAC process can be implemented partially or completely, depending on the needs and maturity of the organisation. There is no need to change or upgrade existing information systems and implementation can be staged to gain specific benefits and ease any impact on existing associate processes. It is also noted that ADAC processes and systems apply equally well to larger utility organisations, including regional or state water authorities.

ADAC is Open Source

IPWEAQ is committed to the use of open data standards to encourage innovation as opposed to control. The user is not locked in to any one software vendor. ADAC can be used to configure any system to generate standard asset data that can be automatically validated and imported directly into asset management and GIS systems.

The non-proprietary XML based data transfer mechanism is free and allows you to exchange ADAC asset data in either direction. The user provides the XML specification to software vendors and data suppliers for them to set up their own systems to provide ADAC compliant data. Software developers are routinely provided with updates to the ADAC schema free of charge and proprietary commercial products are then developed and made available to surveyors and engineers to produce a valid XML.
A number of vendors such as 12d Solutions, Safe FME, Keays, BricsCAD and Trimble have already built ADAC into their products owing to industry demand.

Given the range of commercial products already ADAC-compatible, end users rarely (if at all) need to buy new software, nor do they have to pay any license fee to the ADAC consortium or IPWEA. However, if a council or utility wishes to join the ADAC consortium to contribute to the further development of the schema, an annual fee does apply dependent on the size of the council or organisation. There is additionally a set of tools and guidelines to support consortium members setting up and implementing ADAC. This includes data capture guidelines for surveyors and examples of how other councils have implemented ADAC.

Technical Specifications

The ADAC data file is generated from accurate survey information for import into Geographical Information Systems (GIS). The use of survey accurate geospatial data allows the asset owner to comply with Quality Level A as defined by AS 5488-2013 Classification of Subsurface Utility Information. The most recent version of the ADAC schema allows the inclusion of metadata to record the quality level within the asset management systems. Importantly, this allows asset data to be exported digitally from the utility/asset owner direct to external industry using fully automated request systems such as Dial Before You Dig in a survey accurate format. This eliminates data interoperability problems, prevents the need to recapture or digitise hard copy data and allows industry to value add on the product. The benefit of data distribution through automated request systems versus open portals is the ability for asset owners to incorporate logic, security and business rule checks prior to information being released to end users.

The full schema is defined in a series of XSD files that are available from our office (contact Ross Guppy). An ADAC XML file comprises a root, branch and leaf hierarchy of data elements arranged according to the ADAC schema. The project element contains a hierarchy of sub elements that describe information pertinent to the project as a whole and one further element called ProjectData which contains a hierarchy of infrastructure types and their associated sub-elements to describe the individual feature classes such as pipes, fittings and manholes.

One ADAC XML file is able to incorporate municipal infrastructure of many types including land subdivision developments. For conceptual convenience, in diagrammatic representations, and to aid the maintenance of the schema program code, these are separated into the different types of infrastructure. However, infrastructure from one area can be used in another area. For example, the storm water end structures can be used for sewerage outfalls and water main scour headwalls, and roads might feature in a sewage treatment plant. Moreover, certain water-related customer-owned infrastructure such as drinking fountains and irrigation systems are described in the water supply area despite not being part of the mains supply system. For these reasons, the Owner and Department attributes associated with every asset are used by the receiving entities’ Electronic Transform and Load (ETL) software to select and group assets into the appropriate area of their asset management systems and GIS layers.
Benefits of ADAC

The effective implementation of ADAC can provide the following benefits to a council, utility or organisation:

- Significant time and resource savings in the processing of ‘as constructed’ data.
- Improved consistency and accuracy of detailed asset data provided to council.
- Ability to perform rule-based quality control checks on the supplied asset data ensuring completeness and integrity.
- Capability for automated uploading of asset data to GIS, asset management databases and other tools.
- Transparency of asset registration and valuation processes, resulting in improved corporate governance.
- Capacity to reconcile individual donated trunk assets with infrastructure agreements;
- Potential to ‘round-trip’ asset data and related information to external customers in a consistent format.
- Access to a network of other ADAC user councils and forums that can provide support in leveraging and value-adding to asset registration processes and other associated asset management activities;
- A framework allowing relevant software vendors to understand and support the immediate and practical needs of their users;

Benefits from ADAC Design Lodgement

The benefits gained through the widespread adoption of ADAC for as-constructed lodgement are further amplified by the adoption of the standard for submission of design documentation eg for Council Development Assessment functions. Benefits include:

- Consistent data exchange format enables integration of existing asset information into the engineering design process.
- Improved existing asset information quality provides greater confidence in data provided by Council.
- Potential for automated engineering checks of design data, benefiting both developers and Council development assessment processes.
- Significant gains in the efficiency of as-constructed assessment by automated comparison with approved ADAC design data, and
- Ability for Councils to easily integrate proposed works into forward asset planning decisions.
- Benefits from ADAC As-constructed Lodgement.

Benefits to Land Developers

- Consistent approach to preparing as-constructed information for an expanding number of participating Councils.
- Potential for ADAC-XML data to be produced directly from the surveying process eliminating duplication of effort.
- Improved quality and timeliness of existing asset data provided by Councils;
- Lower costs if built into business processes.
- Validation of ADAC-XML data prior to lodgement.
- Faster acceptance of as-constructed data, and
- Earlier sealing of plans.

Benefits for Survey Consultants

- Use of field equipment and/or survey software to directly output ADAC-XML.
- Incorporation of ADAC-XML design data to provide attribute information, and to immediately highlight deviations.
- Recording of survey metadata into each surveyed point, and
- Eliminated need to draft as-constructed data into drawings for submission.

Benefits to Councils and Asset Owners

- Improved quality and accuracy of asset data provided.
- Ability to apply rule-based engineering and other quality checks to ensure conformance of as-constructed data with engineering criteria and rules, and check completeness of networks.
- Automated loading of asset data into GIS and asset management systems, eliminating human key-in errors and freeing resources for other tasks. Existing councils are reporting drastic reductions in human labour for asset register data entry. As an example, a typical 25 lot subdivision can be fully populated to the asset register and GIS system in less than 30mins, a task that used to take about 4 days.
- Improved corporate governance through more robust asset registration and valuation processes.
- Greater accuracy of financial records.
- Faster turnaround of approval decisions.
- Greater consistency between Councils, enabling greater sharing of asset information and tools.
- Improved network modelling of water, wastewater and stormwater assets.
- Use of a common standard and tools for registration of internal works.
- Automatic Load routines can transfer data from ADAC electronic file format to Spreadsheets, Databases, GIS, Asset Management and Financial Systems in a streamlined and repeatable manner saving time and significant human labour depending on the amount of incoming information at a particular organisation.
- The asset valuation can be automated and simplified. By applying unit rates to the ADAC data, component values and aggregated costs can be quickly calculated.
Financial registration processes are transparent and auditable, resulting in improved corporate governance.

All groups within an organisation, including Development Assessment, Asset Management and Spatial Information services benefit to varying degrees from the adoption of the standard. These benefits combine to improve the asset creation process for the community as a whole. Cost savings for the development industry and asset owners will result in lower infrastructure costs and improved affordability.

**Current Trials**

South Australia is undertaking an ADAC Implementation Benefits trial. The aim of this project is to investigate the options for developers, designers, surveyors and councils to implement the ADAC framework and data specification for fast digital lodgement of infrastructure asset design and as-constructed data.

This project aims to create a positive and effective change management tool with regards to a solution in the market for streamlining the asset data interaction between developers, designers, consultants, construction companies, surveyors and Council field staff and officers.

The project seeks to research the identified potential ‘ADAC implementation challenges’ faced by South Australian councils. The project also aims to provide options for local implementation through three case studies involving land divisions regulated by local government also referred to as ‘pilot sites’.

The Light council pilot site has been initiated and the data translation systems configured. ‘As designed’ drawings have been updated with ADAC data and tested for compliance with the ADAC schema. In addition, ADAC drawing XML (data) exports have been created and testing is underway. The preliminary results from this pilot project are shown in the below table.

<table>
<thead>
<tr>
<th>ADAC</th>
<th>Manual</th>
</tr>
</thead>
<tbody>
<tr>
<td>FME = 16.4 seconds</td>
<td>Conquest + MapInfo input = 10 hrs</td>
</tr>
<tr>
<td>Excel input + VBA = 15 minutes</td>
<td></td>
</tr>
<tr>
<td>Manual input of missing assets = 3 hrs</td>
<td></td>
</tr>
<tr>
<td>Upload to Conquest = 10 minutes</td>
<td></td>
</tr>
</tbody>
</table>

**SEQ Water Supply and Sewerage Design & Construction Code – Case Study**

One of the key deliverables of the SEQ Code is the need for a common standard for the submission of design and as-constructed information. This Asset Information Specification details the requirements of the SEQ Service Providers (SEQ-SPs) with respect to the quality, type, format and completeness of information to be submitted by project proponents and their agents.

The submission of an ADAC XML file detailing the approved design is advantageous to both the relevant SEQ-SP and to the project proponent alike. For the SEQ-SP, it enables the entry of the design information into a proposed-works layer of its Geographical Information System (GIS) and when the as-constructed ADAC XML file is subsequently submitted, it permits machine automated checking by comparing the two XML files. For the project proponent, it reduces the likelihood that problems with the as-constructed XML will delay acceptance of the infrastructure upon completion.
The final as constructed handover drawings must comply with the ADAC specification. Therefore it is highly recommended that design drawings also comply with the ADAC specification to minimise the need for redrafting (or multiple conversions) of drawings.

The ADAC XML format can be considered a ‘data dictionary’ containing a library of asset data, which comprises attributes, spatial information and metadata.

The ADAC schema is used to facilitate the collection, lodgement and retrieval of detailed cadastral and other asset information for both developer contributed and utility-provider constructed infrastructure assets relating to water, sewerage, drainage, roads, bridges and open space. For assets to be donated to, built for, or built by, the SEQSPs, the ADAC schema facilitates the semi-automatic checking, validation and uploading of asset information into the receiving entities’ computerised asset-management systems using ETL software. The generalised process for data transfer is depicted in the below figure.

As the schema facilitates data migration across many types of proprietary software applications, which may run on differing hardware platforms, it must be both machine and system independent. This independence allows the XML file generator to reside within the engineering drawing software, the surveying software, in a stand-alone system, or in some combination of all these to produce the final XML data file.

**City of Gold Coast – Case Study**

The City of Gold Coast has developed an As Constructed Data Standard that incorporates the ADAC specification together with an ADAC XML Data Capture Guideline.

The purpose of this document is to provide practical guidelines and general assistance with respect to the creation and provision of compliant ADAC XML files. ADAC XML files are to accompany any associated bundle of ‘As-Constructed’ plans, drawings, schedules and associated information reflecting newly constructed civil infrastructure and associated assets handed over to the City of Gold Coast.

On completion of physical works and prior to asset handover, ‘As-Constructed’ (also known as ‘As-Built’) information is used to indicate the locations of infrastructure installed as a part of the physical works. The final ‘As-Constructed’ data should accurately reflect material types, specifications and other asset-specific information. The digital ADAC XML file is a complete and detailed digital record of ‘As-Constructed’ Plan information and is used by the City to populate its asset system.

Specific details regarding the preparation and presentation of the ADAC XML can be accessed via the Gold Coast Planning Scheme Policy 11 – Land Development Guidelines.

Once the ADAC XML file(s) are accepted by the City, they are then uploaded to various internal systems and used to assist in the long-term management of the infrastructure. The detailed asset and location data is also available to external agencies in the future via various digital formats.

**Summary & Recommendation**

The Institute of Public Works Engineering Australasia, Queensland (IPWEAQ) is the peak body representing those delivering infrastructure projects for local councils across Queensland. Our members, and the councils they represent, contribute their valuable knowledge and experience to the development of our products.
Our key product, ADAC was developed in 2006 by a consortium of local councils working together to resolve a common problem, long before the concept of regional collaboration became a popular and sensible approach to delivering services to Queensland communities.

ADAC has a proven track record delivering significant efficiencies, value and improved productivity for local councils since its innovation. ADAC and BIM are complementary and together, offer enormous potential value to government and utilities. Similarly, any collaboration between government and the relevant peak body offers better outcomes than if each worked alone.

We would be delighted to work with the Queensland government to maximise the potential value to Queenslanders with the implementation of BIM together with ADAC for major state infrastructure projects by 2023.