ADAC: DESIGN XML AND BEYOND

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On 1 September 2017, Bundaberg Regional Council (BRC) adopted the ADAC system for As Constructed XMLs provided by the Development Industry. However, ADAC, as the name implies, is Asset Design As Constructed: So why doesn't our industry provide For Construction (or Design) XML? With this in mind, Bundaberg Regional Council in conjunction with 12d developed a system to create ADAC XML files at the Design or For Construction phase. The next logical question is: if we have ADAC at design and at the as constructed phase where will this process lead? This paper discusses how ADAC can transform from the asset management area to a project management tool.

What is ADAC?

Asset Design As Constructed (ADAC) is essentially a defined format or specification for the supply of vendor independent 3D data in what is called Extensible Markup Language (XML) format. The data is usually prepared by surveyors and is transmitted as part of an As Constructed package.

ADAC was created by IPWEAQ in collaboration with local governments across south-east Queensland and other states more than a decade ago. Membership has expanded to include State Government Departments and water utilities.

The ADAC specification is endorsed by the IPWEA National Asset Management Strategy Committee (NAMS.AU) which provides national leadership and advocacy in the sustainable management of community infrastructure. ADAC is the only data specification referenced in the International Infrastructure Management Manual (IIMM) that is driven out of ISO 55000 Asset Management Standards.

The ADAC specification is defined by the ADAC XML schema and is generally utilised by Councils to transfer asset information into its corporate systems – in Bundaberg's case a Feature Manipulation Engine (FME) which is a Spatial ETL (Extract, Transform and Load) tool is used to read, write, and manipulate ADAC data so that it can be transferred into our GIS package and accounting software automatically. This process used to be done manually and could take weeks for large projects. Now this only takes hours to achieve, arguably with more accuracy than before.

The Data Standard applies to the following infrastructure asset types:

- Transport
- Stormwater
- Open space
- Water
- Sewerage
- Cadastre / surface
- Electrical
- Telecommunication

The capture of the information is usually described in a generic guideline. Bundaberg Regional Council partnered with both Gladstone and Rockhampton Regional Councils to develop a common guideline which has now been in use since 1 September 2017.

ADAC is considered as an asset management tool.

How does this relate to an actual asset?

Looking at an extract from BRC's guidelines and how it applies to a Stormwater Pipe (Figure 1).

The guideline talks about Asset Capture (e.g., simple linear feature that drains downhill), special relationship (point 2 and 3) and data attributes (e.g., diameter, class, length).

This information has also been summarized in a **data dictionary** that lists all data classes in our schema in a single spreadsheet (Figure 2). In this example, the items listed in the stormwater piper schema are shown.

The **schema** for this single object is quite extensive for one piece of infrastructure, let alone a whole project. The same example is presented again as diameter, class, length.

Case Study

Bundaberg Regional Council recently widened a section of Gahans Road, East Bundaberg. The widening included kerb and channel and underground drainage. For example:

- The GIS format after translation through the FME Script – originally developed by Lyons systems (Figure 3, and
- The design drawing featuring 0.5 m of pipe from an RGU 1/D1 to access hole 2/D1 (Figure 4),
- The actual data

Spatial Relationship: May be coincident to StormWater point features.

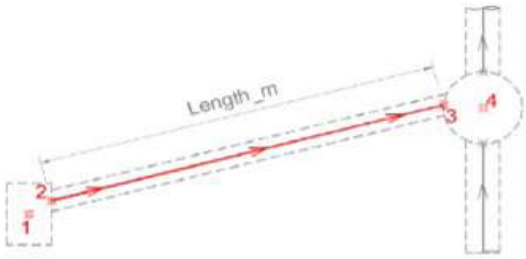


Figure 1.

ients the feature f stormwater	Pipe	Represents a stormwater pipe feature.	Dimensions_Invert_Levels_m	Calls in the standard elements for upstream and downstream invert levels
			Dimensions_Surface_Levels_m	Calls in the standard elements for upstream and downstream surface levels
			Pipe Structure	Container for a choice of pipe cross-sectional measures.

Figure 2 Data dictionary.

```
<adac:StormWater>
  <adac:Pits>
  <adac:EndStructures>
  <adac:Fittings>
  </adac:Fittings>
  <adac:Pipes>
    <adac:Pipe>
      <adac:ObjectId>37352155</adac:ObjectId>
      <adac:ComponentInfo>
        <adac:InfrastructureCode xsi:nil="true"/>
        <adac:Owner>Council</adac:Owner>
        <adac:Status>Design</adac:Status>
        <adac:Notes>1/D1 to 2/D1</adac:Notes>
        <adac:SupportingFiles xsi:nil="true"/>
      </adac:ComponentInfo>
      <adac:US_InvertLevel_m>14.974577</adac:US_InvertLevel_m>
      <adac:DS_InvertLevel_m>14.9672</adac:DS_InvertLevel_m>
      <adac:US_SurfaceLevel_m>16.107092</adac:US_SurfaceLevel_m>
      <adac:DS_SurfaceLevel_m>16.204393</adac:DS_SurfaceLevel_m>
      <adac:PipeStructure>
        <adac:CircPipe>
          <adac:Diameter_mm>450</adac:Diameter_mm>
          <adac:Material>RCP</adac:Material>
          <adac:Class>3</adac:Class>
          <adac:JointType>FJ</adac:JointType>
        </adac:CircPipe>
      </adac:PipeStructure>
      <adac:Cells>1</adac:Cells>
      <adac:ConcreteCoverType>Standard</adac:ConcreteCoverType>
      <adac:Grade>1.384399</adac:Grade>
      <adac:Length_m>0.532899</adac:Length_m>
      <adac:Geometry>
        <adac:Polyline>
          <adac:Path>
            <adac:PolySegment>
              <adac:Vertex>
                <adac:X>437795.706909</adac:X>
                <adac:Y>7251507.597512</adac:Y>
                <adac:Z>14.974577</adac:Z>
              </adac:Vertex>
              <adac:Vertex>
                <adac:X>437796.234145</adac:X>
                <adac:Y>7251507.520378</adac:Y>
                <adac:Z>14.9672</adac:Z>
              </adac:Vertex>
            </adac:PolySegment>
          </adac:Path>
        </adac:Polyline>
      </adac:Geometry>
    </adac:Pipe>
    <adac:Pipe>
      <adac:ObjectId>37352160</adac:ObjectId>
```

Figure 3.

Extrapolating this object throughout a whole project shows why a program like the FME is so important.

Design Process of Creating an XML

Typically, the process described, applies to works in the ground or As Constructed infrastructure.

But ADAC is asset design as constructed – not only As Constructed.

ADAC no longer needs to be only part of the As Constructed package as BRC in partnership with 12d has developed a system that can produce ADAC XML from 12d design. To my knowledge we are the first organization to apply this process - and it has only taken a decade for it to happen.

The key to obtaining design XML or For Construction ADAC XML created by 12d is the ***pickup*** editor (Figure 5). This editor contains all the attributes mentioned in the BRC data dictionary.

The attributes within the pickup editor - then apply to the asset using various ***snippets*** for each class of infrastructure. For example; pipes, pavement road edge, subsoil drain and pathway.

Next there is another function to bring in polygons – such as the pavement – to move information to the ADAC Model.

Once the ADAC model is finished, create the ADAC For Construction (or Design) XML.

This was a brief overview of the 'For Construction' process, that in BRC's case required a number of hours training and still requires quite a bit of review and customisation.

Next Steps in the application of ADAC

The next step in the acceptance of 'For Construction' XML is to create Power Users within BRC's design team. These users will have ironed out any issues with the 12d software and will have developed a mature User Library for BRC projects.

Figure 4.

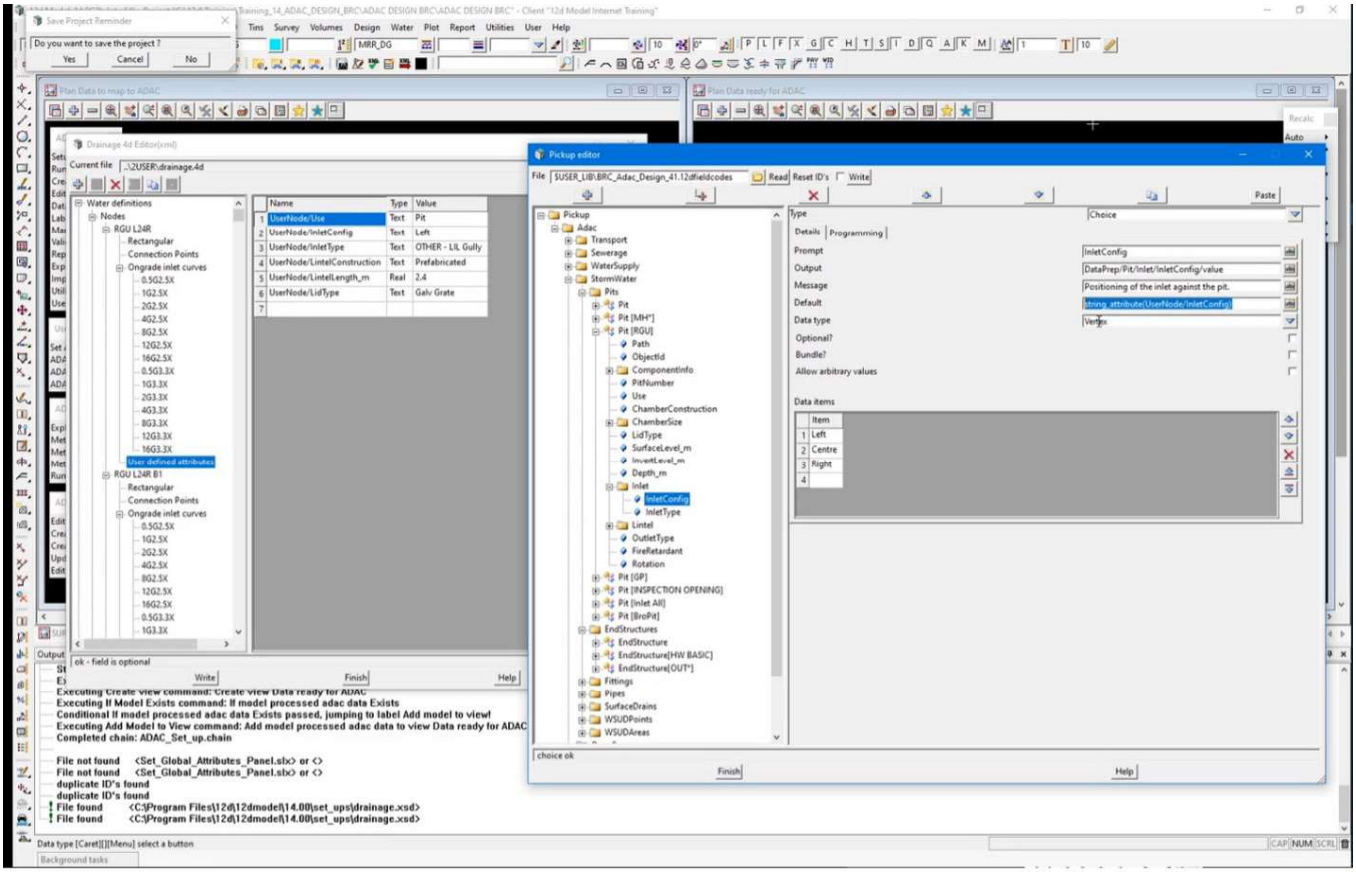
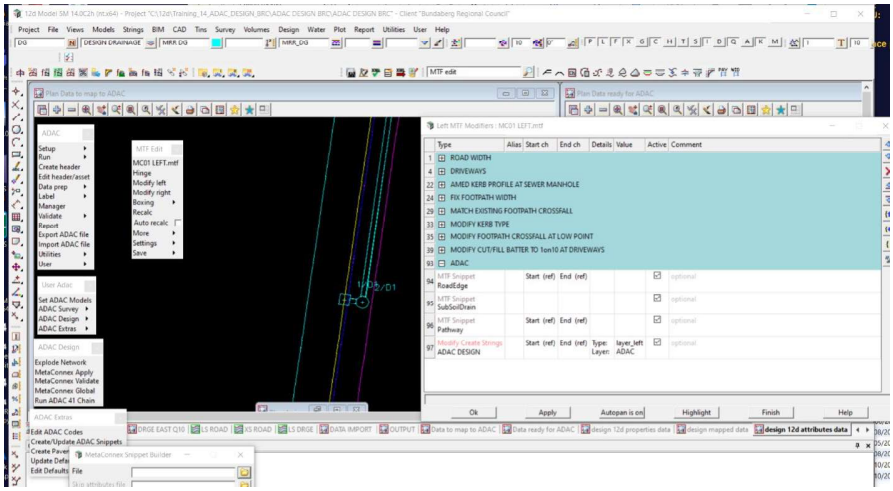


Figure 5 Pickup editor



After Council has a mature program, the intention is to offer training, which should be in the next financial year, to designers in the Wide Bay using some of our examples and volunteer our Power Users as a local contact point.

The key to the next step in the evolution of the use of ADAC Schema is to create an Automated XML Analysis Program (Tool) that is vendor neutral. This may not be possible, and the tool may have to reside in an FME program in Bundaberg's case as it is the current method for importing ADAC. In this regard perhaps the best option is to develop a standard set of customisations in a method that could be used to create future shared scripts – perhaps within the Data Dictionary as shown previously. The program would be configured to incorporate business rules, material types and other constraints given in the planning scheme and the QA process and provide an exception report and mapping tool. This tool could be used equally for the For Construction and As Constructed XML schema. Another part of the Tool would be to allow for a comparison between For Construction and As Constructed and appropriate exception reports.

In discussions with colleagues, it would seem that creating such a tool is a holy grail of ADAC as it is much discussed but not yet found. Realistically this tool will be costly and needs a way to be customized to suit each Council's requirements. With this in mind, a joint venture with IPWEAQ and other parties over the coming months is suggested. More importantly this is where ADAC can transform from something that is used in the Asset Management area to something that is also used as a Project Management tool.

Where will the Design XML lead – with Automation?

There is a golden opportunity to shake-up the construction paradigm. Although not extensive, real opportunities of the previously mentioned transformation are:

- Allowing review of For Construction drawings at a technician level where an exception report could inform closer scrutiny of plans by engineers/project managers
- The Tool could provide an independent service clash report
- We currently get ADAC and As Constructed plans. Is there a need for two methods?

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ABOUT THE AUTHOR

Adam Johnston is the Design Manager in the Engineering Services section of Bundaberg Regional Council. He has extensive experience with local government engineering and ran the Port of Bundaberg as its Chief Executive Officer for a period of 4 years.

Adam has undertaken a number of challenging and varied projects within the Bundaberg Region, such as the design of the Wallace Creek Bridge and the prefeasibility study for the Aviation Precinct. Each project has involved considerable involvement in town planning applications under the Sustainable Development Act and the Local Government (Planning and Environment) Act.

Adam also has considerable experience in identifying potential issues and developing suitable designs and strategies to mitigate impacts due to his broad experience across many levels of government and client projects though his experience at Bundaberg Regional Council, GHD and the Port of Bundaberg