

Managing Projects for Small Drinking-water Supplies

Resources for Drinking-water
Assistance Programme

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1 Introduction

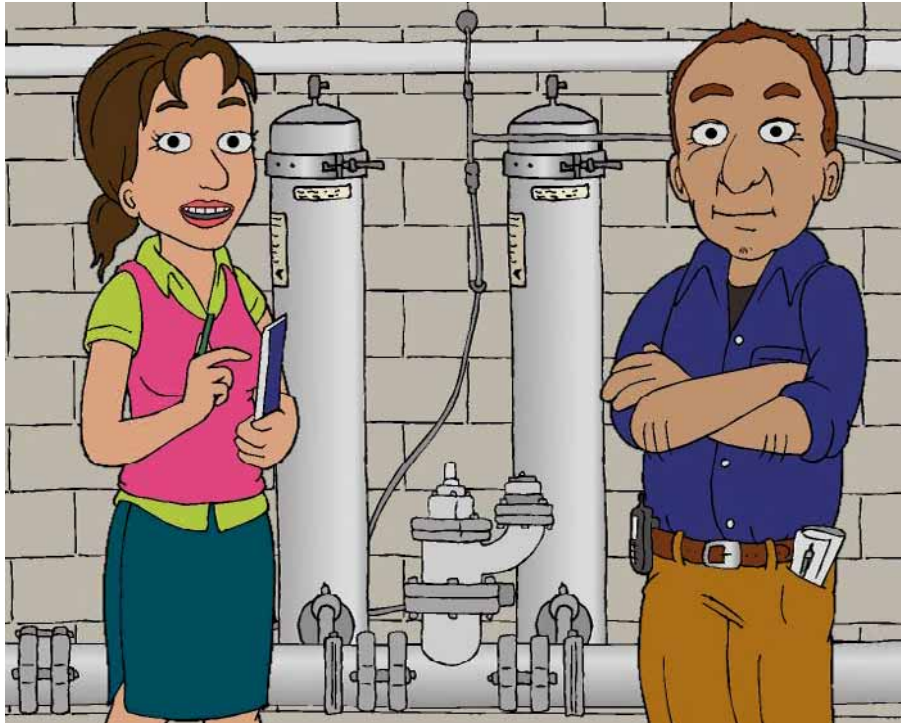
1.1 What this booklet covers

This booklet is aimed at small drinking-water suppliers who plan to build a new water supply or upgrade an existing one. This might be done to improve treatment, ease of use or the reliability of a supply. These kinds of construction projects require careful planning and control to make sure the project is built within budget, is ready to use when it is needed and performs the way it was intended to.

Managing a project will include activities like controlling costs, planning ahead, minimising environmental impacts and ensuring compliance with laws and council regulations. These and other project activities require specialised skills. This booklet introduces the more important concepts. It also describes other issues that need to be considered, such as obtaining resource and building consents.

The methods you use for project management will vary depending on the scale of the work. The process could be as basic as calling a contractor and asking them to do a simple job. At the other end of the scale formal contracts may need to be written with detailed drawings and specifications.

A project manager is essential for complicated or expensive projects to help ensure the project stays on budget, is completed within the agreed time frame and is of the required quality.



1.2 Further guidance

This booklet is part of the Resources for Drinking-water Assistance Programme. Further guidance is available on other aspects of planning, developing and operating small drinking-water supplies, including:

- *Operation and Maintenance of a Small Drinking-water Supply*
- *Pumps Pipes and Storage*
- *UV Disinfection and Cartridge Filtration*
- *Optimisation of Small Drinking-water Treatment Systems*
- *Sampling and Monitoring for Small Drinking-water Systems*
- *Treatment Options for Small Drinking-water Supplies*
- *Pathogens and Pathways and Small Drinking-water Supplies*
- *Sustainable Management of Small Drinking-water Supplies*
- *Design and Operation of Bores for Small Drinking-water Supplies.*

These resources are all available from the Ministry of Health at: www.govt.moh.nz.

2 Project Management

2.1 What is project management?

Project management is the process of planning the tasks that must be completed to reach a goal and managing the progress towards achieving that goal. Normally it also includes monitoring the expenditure against the project budget.

A project manager is usually appointed to take responsibility for these activities. They will manage any communication about time frames, changes to the scope of the project and budgets. Although they don't necessarily need to have technical expertise on water supplies, they will ideally have some knowledge of project management and construction. The project manager may be the owner or operator of the water supply, or an independent person employed by the owner of the water supply.

2.2 Project management activities

The project manager may be heavily involved with a project, or they may choose to delegate a lot of the work to others and just maintain an overview of progress. A few key roles for every project manager are outlined below.

2.2.1 Project monitoring

There are a large number of issues to keep track of during the planning and construction phases of a project, including:

- allowing time for resource and building consents to be processed (see sections 5.1 and 5.2)
- comparing the money spent to the budget
- planning the delivery dates of critical parts and materials so they can be incorporated into the construction at the right time
- planning for the time it will take for the construction of different parts of the project, and the time required to test the new equipment or parts to make sure they work correctly
- quality control for the construction process
- making sure the people who rely on the water supply will have access to safe drinking-water during the construction period.

For larger projects the project manager will need to co-ordinate design consultants for multidisciplinary activities and ensure the contractual obligations of the various parties are being upheld. Ideally, for large projects the project manager should be a specialist who understands both the technical and commercial issues relating to contract management. The project manager can work closely with the client as principal and advise them accordingly.

2.2.2 Communication

Part of the job of a project manager is to make sure everyone involved in the project is kept informed of the timing and progress of the issues related to them. This can help to avoid misunderstandings and ensure potential problems are identified early so that a solution can be found in time to prevent delays.

The owner of the water supply (if they are not the project manager) will probably want to be regularly kept up to date on the progress of the work and the budget. The contractor will also want to be kept up to date on issues that affect their activities.

It is always a good idea to maintain a respectful working relationship with suppliers, contractors and regulators. When problems occur it can fall to the project manager to find solutions that satisfy all parties.

2.2.3 Record keeping

It is essential to keep systematic records of all communications and events that are relevant to the project. This includes recording phone conversations and minutes of meetings (formal and informal). The records will allow the water supplier to show how decisions were made and what agreements were reached with other parties such as contractors and regulators. This can help to avoid misunderstandings and prove a case if a dispute occurs.

Records of the project monitoring activities should also be kept so that progress can be reported to the water supply committee or whoever manages the water supply. All of this information should be kept in a folder or files in a logical order.

2.2.4 Verification

It may be part of the project manager's job to make sure the equipment supplier or contractor has done their job correctly. This could include organising the testing of how well the equipment treats the water, testing whether it is efficient and reliable, and making sure everything that was purchased has been delivered. The designer, Drinking Water Assistance Programme (DWAP) facilitator or the supplier of the equipment can advise on the appropriate testing to ensure the system is operating properly.

3 Design

Obviously you will need to have a clear idea of what is to be built before anything else can be done. Design work can be carried out by the water supplier, or by a specialist such as an engineer.

Good advice is often available from other people operating similar water supplies. They can comment on what works well in their water supply and what doesn't. They may also have advice about experiences they have had with upgrade projects, including recommending contractors and designers. The Drinking-water Assistance Programme is intended to help drinking-water suppliers build these self-help networks.

In many cases it is more than just a good idea to use a professional for design work: there may be regulations that require it. For example, an engineering certificate may be needed for a structural item (eg, a retaining wall) in order to obtain building consent.

Where a design consultant is to be used; the project manager plays a key role in advising the client on the following issues:

- terms of the consultant's appointment
- timing and deliverables
- termination points for subsequent contracts
- client's responsibilities
- project and design risks.

In this situation it would be advisable for the client to appoint a professional project manager to manage both the technical and commercial issues around contract management.

If a design professional is being used, then the project should be discussed with them as early as possible to ensure the information they need can be collected in plenty of time. This might include testing the source water to see how the quality varies over time.

4 Budgeting

Before construction can begin it is important to have a clear idea of the likely costs. The project manager is often responsible for organising a cost estimate for the project and then monitoring spending against the estimate.

A simple cost estimate is just a list of all the items that are going to be required during the project, with a cost for each item alongside. An example is provided in Table 1.

Equipment suppliers and contractors are usually happy to give prices for their equipment and services if there is a good chance of making a sale later on. Take care that the prices they give include *everything* that is needed. Any costs for professional services (eg, design) and for consent fees should also be included. Occasionally there will be indirect costs, such as for tankering water while the project is completed. Most prices given by equipment suppliers and contractors exclude GST. However, to be sure it is usually worth checking.

It is also a good idea to make notes on the estimate, indicating where each figure comes from and any assumptions you have made. For example, a price for an ultraviolet (UV) unit could include a note with the name of the supplier, date of the quote, size and model of the unit, any extras included in the price, and whether the price includes installation or delivery.

Remember to update the budget as the project proceeds. For example, more earthmoving may be required than was expected. These adjustments tend to accumulate over the course of a project and need to be allowed for at the financial planning stage.

Table 1: Example cost estimate for installing a storage tank

Item	Description	Units	Quantity	Cost per item	Total cost	Notes
1	Design fees	Lump sum	1	\$0	\$0	Will do ourselves
2	Project management fees	Lump sum	1	\$0	\$0	Will do ourselves
3	Resource consent fees	Each	1	\$500	\$500	Advice from council (for non-notified consent)
4	Building consent fees	Each	1	\$500	\$500	Advice from council
5	Hire digger to clear site of vegetation	Hours	4	\$100	\$400	Cost for digger hire from Acorn Rentals
6	Remove all vegetation and top soil from the site and dispose of it responsibly	Truck load	2	\$150	\$300	Includes the cost of truck hire and the clean fill disposal fees
7	Preparation of flat gravel platform including drainage	Lump sum	1	\$200	\$200	Cost for the materials and truck hire. Will do work ourselves.
8	Supply and install a 30-cubic-metre tank	Each	1	\$3,000	\$3,000	Quote from Acme Tanks. Includes delivery.
9	Connect the new tank to the existing pipework and install back-flow prevention	Each	1	\$1,500	\$1,500	Quote from Leak-Tite Plumbing.
Total estimated cost					\$6,400	

5 Construction Planning

Once the work required to build or upgrade a water supply has been decided and permission to build it has been granted, some thought needs to be given to how the result can be achieved. This section describes a few of the issues you will need to address when planning for construction.

5.1 Resource consent

Permission is needed from a territorial local authority (city or district council) if land will be affected, and from a regional council if air or water will be affected, in a way that does not comply with the rules of the city/district/regional plan. This permission is called resource consent. Even if resource consent is not required, it may still be necessary to comply with the city/district/regional plan rules.

Councils are required to have copies of their city/district/regional plan available at their offices for anyone to read. They are also often made available online on the council's website. The contact details for the relevant council are in the blue section of the White Pages, or go to www.localgovt.co.nz for contact information.

Where resource consent is needed, it must be granted before any activity starts on the site. Here are some examples of when and what consents may be required.

- When moving earth around a site, such as digging into a bank to flatten an area for construction: a land-use consent may be required from the local council when the quantity moved exceeds a particular value, and a land use consent may be required from the district council.
- If adding a new access into a site: a land-use consent would be required from the district council if the road is publicly owned, a consent from the NZ Transport Agency would be required if the access is to a state highway, and if the road is privately owned permission will be needed from the owner (in writing).
- When building a structure such as a shed or storage tank/reservoir: a building consent from the district council will be required. A resource consent from the district council may also be required, depending on the site. There may also be height restrictions in the area that need to be considered.
- When planning to start taking water, or to increase the amount of water taken, for a water supply: a consent to take water will be required from the regional council. Often there is a minimum value below which water extraction is a 'permitted activity' and no consent is needed. There may also be a requirement for a consent to construct a physical structure such as an intake in the bed of a water course.

Following are the steps you will need to take in order to get a resource consent.

1. **Plan** the work that will be done so that the changes can be described clearly to the council and any uncertainty about the design has been resolved.
2. **Contact** a customer services representative or a resource consent planner at the local council to check whether resource consent is needed for the proposed work (eg, the site may be 'designated' for water treatment purposes). They will need to know the road address of the proposed site. The work may not require resource consent if it complies with the city/district plan. Most councils offer pre-application meetings before a consent application is lodged. This is a good way to discuss a proposal with the council and clarify the key issues and information requirements.
3. **Apply** for a resource consent. If the resource consent planner decides that the proposed work does not comply with the city/district plan, they will require a resource consent application. Application forms can be collected at council offices and can sometimes be obtained online. There will be information that must be included with the application, such as plans of the site, an assessment of environmental effects and a summary of the changes that will occur. The council may want the plans to be drawn by a professional draftsman, or they may accept hand drawings for simple projects. It may also be necessary to include an assessment of the impacts of the proposed work on neighbours. There will be a cost for the resource consent application, which must be paid at the time of applying.
4. **More information** may be required by the council. For example, they may require more details on the design or purpose of the project. They may also require you to obtain permission for the work from neighbours or other 'affected parties'.
5. **Processing:** how the consent is processed will be determined by the council with reference to the Resource Management Act 1991. Projects with no more than minor effects may be able to be processed without public notification. A decision is required within 20 working days for these non-notified consents. Consents for more significant projects may have to be publicly notified. This process takes longer.
6. **Proceed:** you cannot proceed with the proposed work until the resource consent is granted. The consent may include conditions on how the construction is undertaken, or limits may be placed on what may be built.

Information on resource consent applications specific to a local council can be found on their website or by contacting them directly.

5.2 Building consent

Under the Building Act 2004 a building consent is required to construct most new buildings or structures and to modify an existing one. If a building is especially small it may not require consent. This minimum size will vary according to the local consenting authority. Building consents must be granted before any building work is started. It is not possible to seek retrospective consent for most building projects.

Following are the steps you will need to take to get a building consent.

1. **Apply for a Project Information Memorandum (PIM):** this is a detailed report prepared by the council which discloses information that may affect approval for a proposed building project, such as natural hazards on the site or relevant authorisation requirements (eg, resource consent). It is best to apply for the PIM in the planning stage of the project so that any issues with the project can be identified early. There will be a fee for the PIM.
2. **Apply for building consent:** building consent application forms are available at local councils. A list of the information required with an application will be provided on the application form. This will include drawings of the proposed building, electrical details (such as wiring for lighting) and drainage on the site (such as roof guttering) and where that water will be disposed of. There is a fee for a building consent application, which must be paid at the time of applying. The fee generally increases as the value of the construction work increases, so a cost estimate will be needed for the project.
3. **More information** may be required by the council in order to process the building consent. They may also wish to make a visit to the site.
4. **Proceed:** once building consent is granted, construction can proceed. The council may put conditions on the building consent. Typically, building must start within 12 months of the consent being granted and must be completed within 24 months. A time extension can be applied for during that time. Be aware that there is a requirement for inspection of the project at certain times during the construction process. For example, an inspection may be needed before the concrete is poured for foundations because it would be impossible to see the reinforcing and other features afterwards.

5.3 Locate existing services

'Existing services' are the services that are already on the site. They include stormwater drainage, sewer, gas and water pipes, or power and phone cables (above or below ground). It is important to know where these are in order to avoid damaging them and to allow them to be connected to, if necessary. Their position can be located and marked out on site by the provider of these services.

The local council normally holds plans for many existing services, such as pipe work, and they will be able to provide a copy. Plans of the power, phone and gas must be sourced from the distribution companies for those services. The contact details can be obtained from the retailer of those services (ie, the company that sends the utility bill).

Utility providers may be able to use an electronic locator to locate the services and mark their location. They may also dig a hole and measure the depth and mark the location, if this is necessary.

The layout for the construction should be checked to ensure the services won't be damaged and will remain accessible after the project is complete. Because they will eventually have to be replaced or repaired, drainage, sewer and water supply pipes should not be built over without permission.

5.4 Pipe work

Under the Plumbers, Gasfitters, and Drainlayers Act 2006 most plumbing and drainlaying must be undertaken by registered persons. However, there are a number of exceptions; for example, sanitary plumbing (clean water) can be done by anyone in rural districts or by the home owner with assistance from other residents. Note: they cannot have assistance from people that do not dwell in the house. There is also allowance for work to be done by other individuals under the supervision of a registered plumber or drainlayer. All drainlaying (wastewater) must be done by or supervised by a registered drainlayer. See your local council for more details on exactly what is allowed where.

Councils often have standard design details for connections that must be used when connecting to their pipe systems. They can provide information on what the requirements are. Small water suppliers may choose to adopt council design standards in order to ensure that work is done to a good standard and is consistent between customers.

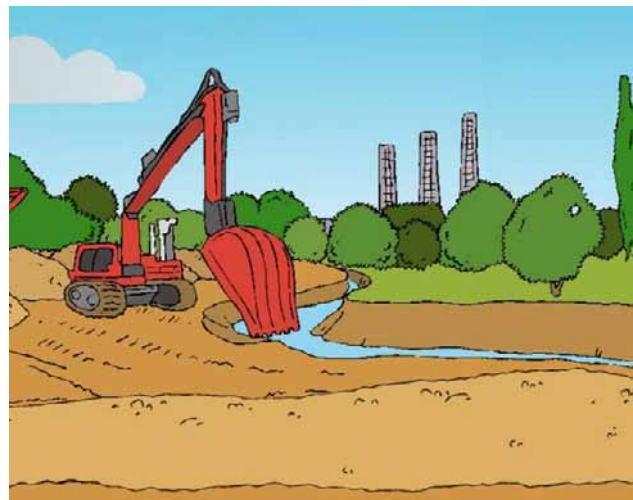
5.5 Roads

Permission will be needed from the road owner if the work will involve disturbing a road to lay a pipe under or next to it, or when putting a new access into a property from the street. The owner may be the local council or a private individual. State highways are owned by Land Transport New Zealand (LTNZ).

The road owner may require drawings and a description of the intended work as well as an assurance that the road will be returned to its former condition.

A road opening notice will be required for works carried out within the road corridor. This can be obtained from the local council. Where the work will block traffic or involve people working in the road, the local council will require a traffic management plan to be provided along with the application.

If any pipe work needs to be laid in or across the LTNZ road corridor, a permit will be required (permission to occupy) to locate that new service within the road corridor. This can be obtained by applying to LTNZ or their local agent.



5.6 Earthmoving

Depending on the quantity of earth to be moved, earthworks may require resource consent from the local council. When undertaking earthworks, soil should be prevented from washing into waterways. This is likely to be a condition of the consents granted to do the work. The earth will need to be well compacted when it is placed where it could slip down a bank or will be built on or driven over in the future. The earth may even need to be structurally compacted to an engineer's specification and tested to ensure it complies with the specification. Again, the building consent will indicate if this is a requirement.

5.7 Power

The power distribution company for the area needs to be contacted when organising power to a site or making a significant change, such as increasing the peak power demand beyond the capacity of the supply. The distribution company is not the company that sends the power bill (they are the retailer). The retailer can supply the distribution company's contact details.

The power distribution company may arrange for the work to be done under their supervision at the owner's cost.

5.8 Phone

You will need to contact the phone line provider to have a new phone connection added to a site. In New Zealand this is Telecom.

5.9 Hazardous chemicals

Some chemicals used in water treatment are considered to be hazardous substances when they are in a concentrated form. An example is chlorine, which is harmless in the water supply but extremely toxic as a gas. The chemical supplier can advise on the storage, handling and site certification requirements for the substances they sell. They can also provide material safety data sheets for the chemicals they supply. These give important safety information for handling a particular chemical.

Hazardous wastes such as asbestos roofing material will need to be dealt with in the appropriate manner. The local council will have information on rules for the disposal of this waste. For further information refer to:

- Department of Labour. 1999. *Guidelines for the Management and Removal of Asbestos*. Wellington: Department of Labour
- Ministry of Health. 2007. *The Management of Asbestos in the Non-Occupational Environment. Guidelines to public health units (revised edition)*. Wellington: Ministry of Health.

6 Contracts

6.1 General

Procuring a contract is a key component for the successful execution of the proposed works. Although procuring a contract for small projects could well be within the capability of the local project manager, for larger projects you are advised to appoint the services of a professional consultant to assist in the:

- preparation of tender documents
- evaluation of tenders
- contract management of the works.

The appointment of a professional consultant to assist with the above will ensure the correct contractual procedures are followed and obligations are met, thereby mitigating risks of contractual claims.

6.2 Hiring a contractor or supplier

Once resource consent has been granted by the council, a qualified person needs to be hired to do the installation and/or construction. Depending on the value of the work, this could be as simple as contacting three reliable local builders and asking them for quotes. However, it could be a more formal process where formal documents are written and tenders are invited to supply, install and/or build a number of items.

A similar process can be used for buying equipment from suppliers.

6.3 Requesting quotes

It is appropriate to contact a few suppliers or contractors to ask for quotes when purchasing simple items like a piece of equipment. Quotes should be supplied in writing. They will normally be valid for a limited period, such as 30 days.

There may be differences between suppliers and contractors that make their product more desirable. Suppliers can send technical information on their products so that the various technical features can be compared. Here are some general issues to consider.

- Buying equipment and services locally can be important for servicing later on.
- The quality of equipment and workmanship will vary. It can be helpful to talk to other water suppliers to find out what their experiences have been.
- Compatibility with other equipment in the water supply, or even nearby water supplies, may be important to reduce the number of spare parts that need to be purchased. It also means that the operation and maintenance of fewer equipment items need to be understood.
- Some types of equipment may be easier to operate or calibrate than others.
- The efficiency of equipment may vary. This could mean that an item is more expensive to buy but the difference is paid for in cheaper running costs.

A more formal process for obtaining prices is needed where there is a large amount of work involved, such as laying a pipeline or constructing a building. Section 6.4 on tendering describes the process that is often used for larger projects.

6.4 Calling tenders

Sometimes a formal process is used to obtain proposals to carry out a project or supply equipment for an agreed price. This is done to make the risks and obligations as clear as possible for everyone involved. As indicated earlier, this is important for large projects.

The common method of doing this is generally referred to as 'calling tenders' or 'tendering'. Using a construction project as an example, the water supply owner would release a set of tender documents to one or more contractors. The tender documents would define the services required and any conditions there are on their delivery. The contractors would then place a bid on the project for what they believe the cost of construction will be, along with any conditions that apply to their offer.

6.4.1 Preparing tender documents

Normally tender documents are prepared by a qualified professional such as an engineer or architect. This is because the documents are reasonably complex and errors can have serious financial consequences. The components of a typical set of tender documents are as follows.

1 Drawings and specifications

These outline the work to be done. Both the drawings and the specifications describe the extent and quality of the work in enough detail to avoid confusion, and to prevent a tenderer offering equipment or services of a lesser quality or size than is needed. The drawings and specifications have equal importance. Some information is easier to represent on a drawing and some information is easier to represent in writing on a specification. In many cases, specialist design expertise will be needed for the preparation of these drawings and specifications.

2 Tender schedule

This is a table used by the tenderer to list a breakdown of their prices. The idea of the tender schedule is to give a basis for changes in the scale of the project. For example, if the digger needs to remain on site to clear an extra area that was not originally asked for, the same rate would be charged for the work as is listed in the schedule. For this reason the tender schedule should be broken down as far as is practical into the tasks that will be undertaken.

Table 2: Example of a tender schedule for the installation of a storage tank

Item	Description	Units	Quantity	Cost per item	Total cost
	Hire digger to clear site of vegetation	Lump sum	1		
	Remove all vegetation and top soil from the site and dispose of it responsibly	Cubic metres	10		
	Prepare flat gravel platform, including drainage	Lump sum	1		
	Supply and install a 30-cubic-metre tank	Each	1		
	Connect the new tank to the existing pipework and install back-flow prevention	Each	1		
	Total cost				

3 Conditions of tender

These are the conditions that apply to how tenders need to be written and delivered, who to contact with questions about the project, and how the tenders will be judged. Here is a checklist of what to include in a tender document:

- when and where tenders must be delivered (date, time and place)
- the amount of any deposit required to obtain tender documents and whether or not such a deposit is refundable
- where and to whom enquiries about the project should be addressed
- requirements for the format of the tender responses
- if appropriate, a clause advising that the lowest (or any) tender may not necessarily be accepted
- how the tenders will be evaluated
- how both successful and unsuccessful tenderers will be notified.

4 Conditions of contract

Rather than write up clauses covering every conceivable event and how these will be managed, contracts for construction projects generally rely on standard conditions of contract. The conditions of contract that are normally used for construction are called New Zealand Standard 3910:2003 Conditions of Contract for Building and Civil Engineering Construction. This standard contract document can be found on the Standards New Zealand website: www.standards.co.nz.

Clearly it would be rare for one set of contract conditions to apply equally to all projects, and so quite a few of the clauses will need to be changed to suit the situation for a particular project. These are called the special conditions, and they list new clauses to replace clauses in the standard conditions that don't apply. This method means that a

contractor familiar with the standard conditions can quickly see where the contract conditions for the project are different from what may be normal.

6.4.2 Asking for tenders

Once the documents are prepared, the tender can be advertised in the newspaper (local and/or national newspaper) and/or the documents can be sent directly to suitable companies. There will be a defined tender period in which the tenderers prepare their bids. They will often have questions about the project. The answers to the questions should be given to all of the tenderers to make sure the process is fair.

6.4.3 Evaluating tenders

In order for the process to be fair, tenders must be judged according to the criteria stated in the 'conditions of tender'. These evaluation criteria are provided in the tender documents so that the tenderers know how they will be judged against their competition.

It is vital that the evaluation process is undertaken strictly in accordance with the evaluation criteria stated in the tender documents and that all correspondence during this phase of the project is accurately recorded. In some cases the evaluation criteria may simply state that they will be judged on their price only. The evaluation process is then simply a matter of selecting the tender with the lowest price that complies with all the minimum criteria that were set.

Alternatively, there may be a range of factors listed in the 'conditions of tender' as evaluation criteria. These could include previous experience in the type of work, technical skills, health and safety practices, the quality of the people offered for the work, their location, and any other factors that are important for the project. Obviously, comparing the tenders then becomes much more complicated. A standard process is normally used so that the result of the evaluation is objective and can't easily be challenged by an unsuccessful tenderer.

Once the successful tenderer has been chosen they must be notified in writing. The same applies to the unsuccessful tenderers.

6.4.4 Contract documentation

When the successful tenderer has been notified, all the relevant documents are bound together and signed by the successful tenderer and the party for whom the work is to be done. This forms the 'contract document'. Don't forget to include any important correspondence with the successful tenderer that occurred during the tendering process which clarifies, alters or affects the work to be completed, or the terms under which work will be completed. This correspondence is as much a part of the contract conditions as the original documents.

At this stage it would be appropriate to formally appoint the engineer to the contract if this is deemed necessary by the scope or size of the project.

7 During Construction

7.1 Quality control

A supervisor is normally appointed to ensure the project is constructed according to the wishes of the owner. Quality control involves inspecting the construction to make sure it complies with the drawings and specifications (eg, checking that the specified products or correct pipe material are actually installed and that the concrete being laid is of the correct thickness).



This involves being on-site when particular activities are taking place. The installer or contractor can be asked to contact the supervisor before they undertake any work of interest. If something is not correct, the contractor needs to be told as soon as possible.

Depending on the nature of the project, the owner of the water supply, the project manager (if the project manager is not the owner) or another person employed by the owner may supervise the construction. They will need to have enough expertise to know whether the work is being undertaken correctly. The supervisor should record what is happening at the site and any conversations with site personnel. The supervisor should regularly report back to the project manager/owner.

On larger projects, where a professional consultant is appointed to undertake the contract management, the consultant may provide a person to provide quality control for the works. This will ensure the work is being carried out in accordance with the design and project specifications.

Taking regular photos during the construction can be a useful as a record and for discussion with others when seeking a second opinion. It is particularly helpful to record details that will be hidden later on, such as reinforcing steel in concrete.

A period of commissioning and the final inspection normally occur at the end of the project to check that everything has been installed correctly and is functioning as it should. This could include running the water supply for a period of time to make sure it is going to be reliable. In most instances the supplier of the various components (pumps, treatment units, etc) will be required to be on-site during the commissioning and testing of the works. The project manager should ensure that the cost associated with this is included in the quotes provided for the equipment.

7.2 Consent compliance monitoring

If the local or regional council has granted consents for the work, they may want to monitor compliance with those consents. This often involves a council representative visiting the site during and/or after construction.

7.3 Health and safety

Before construction, the contractor needs to have written a health and safety plan specifically for the site. They will need to comply with this plan at all times.

Health and Safety on construction sites is governed by the Health and Safety in Employment Act 1992. The Act promotes the prevention of harm to all people at work and to those in the vicinity of places of work. A quick guide to the Act can be found at: <http://www.osh.govt.nz/law/quickguide/index.shtml>.

7.4 Environmental management

Environmental management of the site may include making sure construction waste is disposed of responsibly, construction noise is kept to a minimum, and erosion and sediment are controlled on the site. The local council will be able to give advice on the environmental management required for a site and is likely to have placed conditions on it.

If the construction site is located on or near a historically significant site, or if in the process of construction items of historical significance are uncovered, certain procedures will need to be put in place to document what is found. See your local council for details.

7.5 Payments

The person who is project managing the project may be expected to arrange for the payment of the contractor. If the work is being undertaken to a formal contract then there may be regular payments as the project is completed. For a small, simple project the payment can usually wait until after the work is completed.

When work is paid for it is important to make sure that it has been completed satisfactorily.

For larger projects, the appointed engineer to the contract has the delegated authority to approve payments. This person will ensure the appropriate payment is made for the item of work involved.

If the contractor issues a claim for additional work, the engineer to the contract will provide an independent assessment of the claim and rule on it accordingly. The contractual obligations associated with payment claims and variations are generally beyond the expected ability of a local project manager and require the input of a professional.

7.6 Disputes

A 'dispute' is the term used for a disagreement at any time after the contract agreement has been signed. Most disputes are resolved by negotiation. Sometimes an impartial expert needs to be called in to decide on a fair outcome. Where there isn't a solution that is acceptable to both parties, there are formal procedures that can be followed.

Any commercial or residential construction contract in New Zealand is automatically covered by the Construction Contracts Act 2002. The Act contains provisions for the protection of the hirer and the contractor. The Act includes an adjudication process to resolve the dispute. The Construction Contracts Act 2002 can be viewed online at: <http://www.legislation.govt.nz>.

The Disputes Tribunal deals with disputes up to \$7,500 (or \$12,000 with the agreement of the parties). The Consumer Guarantees Act also applies to building practitioners. This states that any service contracted by a consumer should be carried out with reasonable skill and care. The service should be provided at a reasonable price and fit for its purpose.

If NZS 3910:2003 Conditions of Contract for Building and Civil Engineering Construction has been used, it contains a procedure to follow if a dispute occurs, which includes adjudication.

7.7 Producer statements

Producer statements were introduced with the Building Act regulations in 1992. The producer statement system is intended to provide building consent authorities (such as a local council) with the evidence they need to issue a building consent or a code compliance certificate.

If the council requests producer statements as a condition of a building consent, then a suitably qualified person needs to be employed to certify the work.



Producer statement forms are numbered from PS1 to PS4, as follows.

PS1 Design is intended for use by a suitably qualified independent design professional where the local council requires a producer statement for establishing reasonable grounds to issue a building consent.

PS2 Design Review is intended for use by a suitably qualified independent design professional where the council requires an independent design professional's review as the basis for establishing reasonable grounds to issue a building consent.

PS3 Construction Form is a certificate of completion of building work. Forms commonly used as a certificate of completion of building work are Schedule 6 of NZS 3910:2003 (see section 7.4 of this booklet for more details), or Schedules E1/E2 of NZIA's SCC 2007 (you will find this under technical documents at: <http://www.nzia.co.nz>).

PS4 Construction Review is intended for use by a suitably qualified independent design professional who undertakes construction monitoring of the building works, where the council requests a producer statement prior to issuing a code compliance certificate (which confirms that the council is happy with the work that has been completed). The professional must be employed to supervise the construction prior to work commencing.

8 After Construction

8.1 As-built plans

It is a good idea to have final plans drawn up with everything that is known about the site after construction is complete. These are called as-built plans. A hand-drawn sketch may be adequate for small projects. For large projects professional drawings may be required.

As-built plans show the location of hidden pipes and cables, the location and design of buildings and equipment, wiring diagrams for electrical work, and many other features of the project. They are very helpful for the maintenance of the system and when making further changes to the water supply in the future. They are particularly useful when new people become involved in a water supply, because they won't be aware of what was constructed or when it happened.

Often these plans are a requirement of a building consent. The information the council asks for on the as-built drawings for building consent may include:

- the boundaries of the site and the extent of the outside services connected to the system, such as water pipes and sewer lines
- any buildings, pipes, electrical cabling, monitoring equipment, underground and above-ground services that have been altered during the work, and possibly those that haven't as well
- details of the items that have been installed, such as the type and pressure rating of pipes installed or the make and model of equipment.

8.2 Operations and maintenance plan

If there is already an operations and maintenance plan for the water supply, then any alterations or additions to the water supply should be added to the plan. This would include altering the drawing(s) of the water supply and adding the new equipment manual, along with records of any guarantees that apply.

Refer to *Operation and Maintenance of a Small Water Supply*¹ for specific information on preparing an operations and maintenance plan.

¹ Ministry of Health Resources for Drinking-water Assistance Programme.

9 Places to Get Information

Table 3 below lists some people and places that can provide more information.

Table 3: Sources of further information

Source	Expertise	Listing in phone book
DWAP facilitators	All aspects	District Health Board – public health unit
Water testing laboratories	Water analysis and interpretation of results	Analytical laboratories
Local water treatment plant operators	Operational advice	District councils and other water treatment plant owners
Regional council	Local water sources and likely contaminants; restrictions on use	Regional council
Local council	Building and resource consent forms and advice	District/city council
Specialist water treatment equipment suppliers	Capabilities of a particular supplier's equipment	Water treatment
Geotechnical engineer	Where earthworks are significant and design is needed	Geotechnical services
Treatment plant designers	All aspects, especially the design of treatment systems and pipe work	Environmental consultants
Master builders	Building construction and costs	Builders
Master plumbers	System installation and costs for installation	Plumbers
Registered drainlayer	Underground pipe laying and costs	Drainage

10 Case Study: Water Supply for a Marae

A new marae was being built and needed to put in a water supply. The Marae Trust decided that the system should be of a size to cater for a resident population of 50 people, with sufficient storage available to enable them to supply up to 200 people for events of one day or less. The Trust appointed Waka to project manage the development of the water supply on behalf of the marae. To ensure accountability and check progress, the Trust required Waka to report back to them at monthly intervals.

Waka then joined his local DWAP group to obtain assistance. From this group he found out that there was a well-known aquifer the marae could use as a potential water supply. He also (with the help of his local DWAP facilitator) calculated the flow rate required for his bore and the amount of storage needed. He also drew up a plan of how the reticulation on the proposed site would work and got it checked at a DWAP meeting.

Using this information, Waka asked his local contractors for a budget cost estimate for each part of the job and came up with the following.

Table 4: Budget costs estimate for water supply to marae

Item	Description	Units	Quantity	Cost per item	Total cost	Notes
1	Design fees	Lump sum	1	\$0	\$0	Will do ourselves
2	Project management fees	Lump sum	1	\$0	\$0	Will do ourselves
3	Resource consent fees	Each	1	\$500	\$500	Advice from council (for non-notified consent)
4	Building consent fees	Each	1	\$500	\$500	Advice from council
5	Drilling bore	m	50	\$300	\$15,000	Budget cost estimate from Bruce Mclean Drilling
6	Accessories associated with bore	Lump sum	1	\$15,000	\$15,000	Budget cost estimate from Bruce Mclean Drilling
7	Preparation of flat gravel platform, including drainage	Lump sum	1	\$500	\$500	Cost for the materials and truck hire. Will do work ourselves.
8	Supply and install a 40-cubic-metre tank	Each	1	\$10,000	\$10,000	Quote from Acme Tanks. Includes delivery.
9	Install reticulation	Each	1	\$30,000	\$30,000	Quote from Leak-Tite Plumbing.
Total estimated cost					\$71,500	

When Waka presented these figures to the Trust they realised the job was bigger than had first been anticipated and decided to engage a consultant to provide some specialist advice for certain aspects of the project. As a result the Trust engaged Water Solutions to prepare the tender documents, conduct a tender review and manage the construction process. They also conducted a review of the work to date.

Waka was to get all the consents required and secure the necessary funding. The cost estimate was revised based on recommendations from Water Solutions. To improve communication, Waka also decided to revise the cost estimate at monthly intervals throughout the project, and to include it as part of his presentation to the Trust. This communication protocol meant that all parties were kept informed of the cost implications resulting from changes to the project.

Waka obtained the consent to abstract water. Due to the small flow required this was non-notified. Drilling wells relies heavily on local knowledge, so Water Solutions recommended Waka contract Bruce Mclean Drilling (as they had worked with them in the past and were impressed with their work and level of knowledge about the aquifers in the region). Water Solutions prepared a basic contract and negotiated a schedule of rates for which Bruce Mclean drilling would do the work. The driller was a well-known local, so it was decided that Waka could manage this phase of the works.

Once the bore had been drilled and tested to ensure there was adequate flow, Water Solutions prepared the tender documents for the reservoir. To save costs it was decided that a working party from the marae would do all the manual labour for the installation. As a result, Waka organised a working party from the marae to prepare the pad for the reservoir and to dig the necessary trenches for the reticulation. The installation of the reservoir was then completed by a separate contractor under the supervision of Water Solutions. The installation of the reticulation was completed by a local plumber with the assistance of the working party. The plumber was paid at an agreed hourly rate and the marae supplied the required materials to his specification.

In the end the project cost \$91,670. Cost over-runs were due to: engaging an outside consultant, needing to drill to 70 metres instead of 50 metres to find the desired aquifer, and deciding to install a 60-cubic-metre tank rather than a 40-cubic-metre tank to allow for larger gatherings. Since these cost overruns were communicated promptly, and the implications of the changes to the project's scope were made clear, these changes did not cause significant problems.