



PRODUCTIVITY IMPROVEMENTS & ESCALATION INTERVENTION PLAN

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1. INTRODUCTION

The Stronger Christchurch Infrastructure Rebuild Team (SCIRT) has been established between CCC, CERA & NZTA, and the Non-owner Participants (NOPs) of City Care, Downer, Fletcher Construction, Fulton Hogan, and McConnell Dowell. These parties are engaged through an Alliance commercial arrangement.

SCIRT is tasked with reconstruction of the horizontal infrastructure damaged in the earthquakes of 2010/11.

SCIRT's scope of works is to manage the reconstruction and repair the City's:

- Water
- Wastewater
- Storm water
- Roads
- Retaining walls
- Bridges

The rebuild of these assets is against the background of significant other earthquake rebuild works which is expected to create excessive demand for goods and services which will out strip normal supply.

2. WHAT ARE WE TRYING TO ACHIEVE?

2.2 Value for Money (VfM)

A key goal of is to clearly demonstrate VfM from the wider SCIRT team to the people who are paying for this rebuild, namely the people of Christchurch and New Zealand. In considering the wider SCIRT team we recognize this as any party either directly or indirectly receiving payment via SCIRT for their contribution to the rebuild.

As funds are limited, it is essential that before expenditure is committed, a strategic approach is developed and applied to ensure that we can get more from less and the limited funds are spent wisely.

The following 3 Tier proposition will be executed for all works within SCIRT:

2.2.1 Strategy - 'doing the right thing'

Through input and alignment to the various Christchurch City Council and CERA strategic plans we will ensure that we design and build the appropriate infrastructure to cater for the needs of these plans.

2.2.2 Priority – 'doing the right work in the right order'

Once the strategic plans have been finalised, we can then determine the criticality of each asset and in turn determine the order of the works to ensure that sequencing is optimized and network security risk is minimised. Where possible we will adhere to our 'one pass' philosophy to minimise the costs and disruption associated with revisiting sites.

2.2.3 Efficiency - 'execution of the works in the most cost effective way'

Focus on developing continually improving and consistent delivery which removes cost through the introduction smart design, techniques and equipment that promote enhanced productivity. This Tier will challenge business as usual practice and 'Efficiency' gains are expected to be delivered in every stage of the Programme of Works including Asset Investigation, Design and Delivery.

2.3 Control Price Escalation

It has been recognised that the Rebuild activity has the potential to create considerable pressure on price escalation. Therefore this paper addresses some of the issues the wider Construction Industry in Canterbury and New Zealand will face and how we can work collaboratively to address this challenge.

The challenge given by the Board of SCIRT is to maximise the containment of escalation experienced with productivity improvements. To achieve this challenge SCIRT are working to identify components of cost increase that are at risk of escalating at a rate that outstrips price increases as measured by the consumer price index (CPI), and implementing strategies to control or contain these components. (Fig 1 – Escalation Control). We need to enhance performance on our unit rate activity (do it quicker/smarter), in conjunction with eliminating waste out of the supply chain (procure it for less).

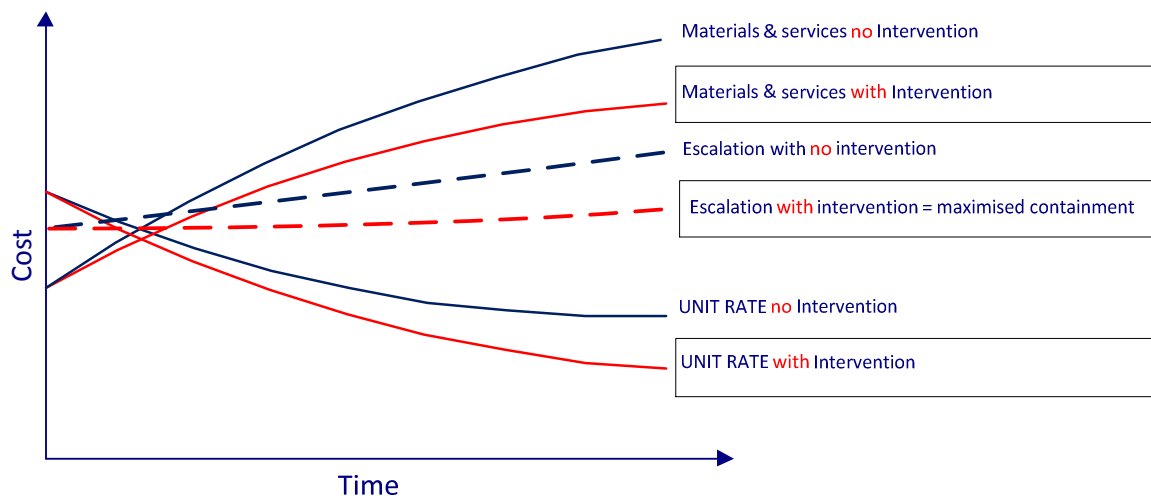


Fig 1 – Escalation Control

Cost control will be one area of focus of intervention on escalation. However, this alone will not achieve the desired outcome. We will also need to make significant productivity gains in order for the combined effect to keep escalation at a manageable and affordable level. To achieve this objective, we have calculated that a 5% increase in escalation requires a corresponding 10% improvement in productivity.

3. HOW WILL WE GO ABOUT IT?

To deliver and maximize the containment of escalation during the rebuild we will require to both actively manage costs whilst simultaneously increasing productivity levels.

3.1 Cost Control

To date the following opportunities have been identified in controlling escalation:

3.1.1 Direct cost elements of the construction work

- a. **Labour** – the cost of labour is at risk of increasing at unsustainable rates as the volume of work required by the rebuild grows. At present we have a two pronged a strategy for impacting escalation.
 - i. Influence the local industry – SCIRT are actively working with the New Zealand Contractors Federation to contain labour rate increases through dialogue to achieve shared understanding of the long term impact of irresponsible engagement of labour from within the existing labour force. Dialogue has also been initiated with recruitment agencies to ensure that they understand the impact of irresponsible behaviour impacting existing labour rates. A clear message was given that such behaviour would be actively opposed by SCIRT.
 - ii. SCIRT are working with training providers, the NZCF and Government to develop a programme to attract local Canterbury residents into the civil construction industry, to train new entrants and to up skill existing employees. Bringing local new entrants into the industry has the benefits of alleviating accommodation demand in Canterbury with the flow on effect of increasing rental prices, and containing the costs to the programme of transporting and accommodating external resources.
- b. **Plant** – The ready availability of plant and equipment within the market suggests that unwarranted escalation is unlikely to result. No intervention at this stage is foreseen.
- c. **Materials** – Material rates are negotiated with suppliers regularly for inclusion in the estimation process. Competition is strong across the market with suppliers indicating an ability to increase production to meet the needs of SCIRT. Delivery teams are creating additional competition through direct negotiation at project level. We are working to inform the supply industry of the forthcoming needs of the programme to ensure availability of materials.

Bulk purchasing will be considered where significant value can be gained. However, in the interest of maintaining a sustainable industry, we will not buy exclusively from a single supplier.
- d. **Subcontractors** – Whilst the work can be undertaken by local/regional resources, and competition still exists, price tension will remain as a positive influence. A lack of work across New Zealand is expected to attract external contractors; this may bring an added cost impost of travel and accommodation costs. It is expected that competition between delivery teams and desire of contractors to secure work will contain unwarranted escalation.

3.1.2 Design Cost

Agreements are in place with 18 Consultant organisations. These are currently under review with a process for justification of profit and overhead recovery based on auditable business

performance. Any further rate increases will be agreed annually on the basis of recorded CPI statistics. The shortage of work across New Zealand is attracting people to relocate to Christchurch to secure long term work. It is not expected that unwarranted escalation will result.

3.1.3 Specification Creep

There has been an on-going process of modification of Specification documents from those that existed pre September 2010 in an attempt to improve resilience of the networks. These modifications are often creating an increase in the cost of the works. Costs arising from the specification creep will create an escalation of cost over and above the initial Programme Estimate. These creep costs will be captured and recorded in the Value Register as a negative.

3.1.4 Scope Change

The baseline scope of the programme is to repair the networks back to a condition similar to that of pre-September 2011 condition, utilising modern materials. With the best of intentions people from the Asset Owners, Design and Delivery Team organisations are initiating scope changes with the intent of producing an improved outcome. Significant effort is required to ensure that 'betterment' is identified and that appropriate budget from a separate funding stream is allocated prior to work commencement. Un-tracked scope change will drive an escalation of cost over and above the initial Programme Estimate.

3.1.5 Legislation Changes

There are instances in which new Legislation is enacted, ie revised Environmental Standards for disposing of potentially contaminated material. The imposition of such new legislation across the rebuild programme will have significant impact on the cost of the works. A moratorium for the operation of such legislation could be initiated in an effort to contain cost that would not have been incurred had the earthquakes not occurred.

Opportunities where considerable savings can be made without detrimental impact will be evaluated and departure sought where the value is significant. These savings will be recorded in the Value Register.

3.1.6 Imposition of client organisation operating standards, such as Traffic Management or Consenting requirements

Client organisations are in some cases operating in a manner that is best described as Business as Usual and stipulating requirements across the programme of works that will be unsustainable or not affordable as the works ramp up. Such response will give rise to escalation of cost over and above the initial Programme Estimate.

3.2 Productivity Gains

3.2.1 Productivity Gains within the Integrated Services Team (IST)

The Project Phases that are accountable within SCIRT's IST consist of a number of 'gates' which define the current status of each Project. Projects require to be moved through efficiently without unnecessary delay in order to keep a steady and predictable flow of work to the Delivery Teams to undertake the physical works.

It is essential that each 'gate' performs as scheduled to avoid a bottleneck occurring as this will result in delays and inefficiencies.

Each Project has a Schedule determined at concept design stage and **performance against schedule** is measured against the baseline. Relevant Teams and their team leaders are accountable for performance. Future workload for that team is direct result of their recent past performance.

This will drive efficiency and competition internally for the design teams to perform.

(N.B. KPI measures are also established that measure the quality of the output to ensure SCIRT delivers quality designs in a timely manner that can be built productively and efficiently).

The focus of performance improvement will concentrate on initiatives such as **standardized designs, blanket consents, approved design changes to the IDS, design trials** and introduction of **new products and techniques**.

Further improvements will occur through **Early Contractor Involvement (ECI)** by the Delivery Teams working alongside the Design teams. The focus is on optimizing the design solution to improve 'buildability', enable risk to be understood and managed early and align in terms of methodology and delivery period. It would be an expectation that the ECI will reduce both the time and cost of the Projects and this value will also be measured.

Designers will continue to consider the whole cost of delivery in their designs. This may in some instances mean more expensive materials are specified if there are considerable advantages in construction which result in overall lower delivery cost and/ or ongoing operational cost benefits.

Value transferred through to the Client through the Design process will be captured in the **Value Register**.

3.2.2 Productivity Gains within the Delivery Team

The greatest opportunity with regard to construction productivity will be in daily/ weekly target setting and increased awareness and review of these targets throughout the team on site.

Similar to the high level of understanding and wide acceptance that 'Safety' can be experienced out on site, our focus is to develop a consistently applied '**Culture of Productivity**' within the Delivery Teams and their Contractors.

The outcome will create ownership of productivity expectations and encourage all crew members to identify initiatives to improve performance.

Development of a 'Culture of Productivity' on site

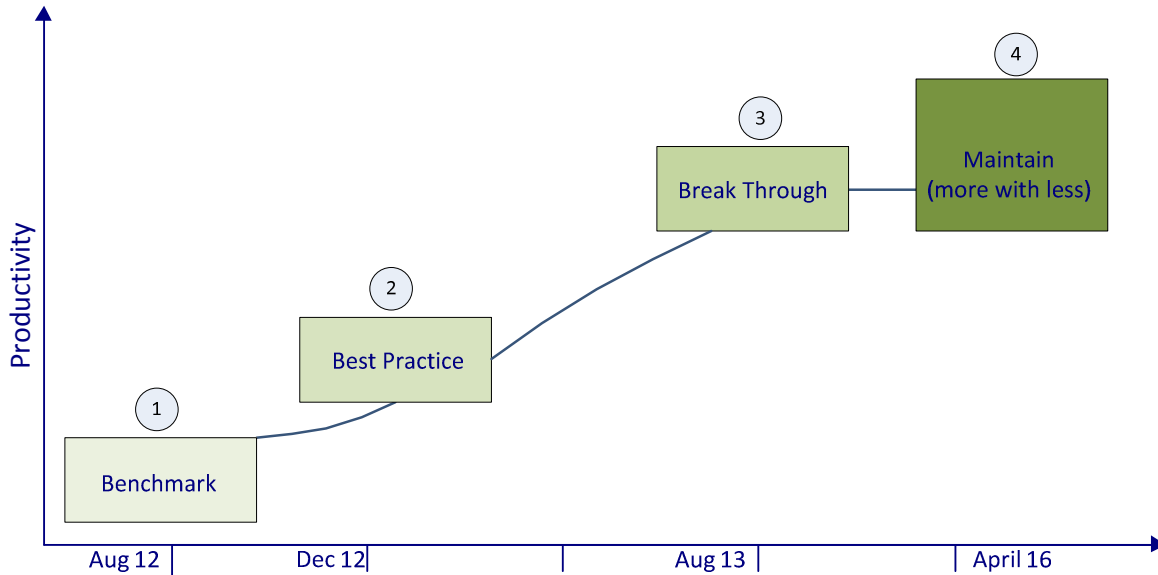


Figure 2 – Productivity Development over time

The diagram above depicts the 4 stages of development to achieving a 'culture of performance' on site. The ultimate outcome from this behavioral and process change will be improved productivity through time across all Delivery Teams and their respective sub-contractors through enhanced understanding and target setting.

Stage 1

Benchmark - This is the stage we are currently experiencing. Productivity measures across the sites vary, both in capture of data and performance. This can vary from Delivery Team to Delivery Team, and from site to site.

Establishing benchmark productivity levels will enable SCIRT to make comparisons by Project and by Delivery Team.

Stage 2

Best Practice - From the information derived from comparisons, the aim will be to bring productivity across all projects up to the consistent level of the best performing Delivery Team. It is considered our greatest productivity gains in the shortest time period will be achieved by targeting this.

Stage 3

Break Through – This stage represents 'Peak Productivity Performance'. Separating this into its own stage will not preclude new ways of doing things at an earlier stage, however, heightened focus will be given to adopting new methods, equipment and techniques to continue the productivity gains.

Stage 4

Maintain – During this stage the rebuild activity, not only from SCIRT, will be at a maximum with peak demand on resources expected to remain at this level through to SCIRTs rebuild completion. It is

anticipated SCIRT, through its Delivery Teams, will have approximately 1000 workers with less than 1 year's construction experience (50% of our workforce).

Productivity levels would normally erode under such circumstances. This stage will focus on overcoming the challenges this presents and it will also work in conjunction with SCIRTs training strategy for up skilling existing staff and developing new staff.

To develop the 'culture of productivity on site' a detailed action plan on how to achieve each stage will be produced by the Resources Manager in advance of each stage in the timeline.

3.2.3 Productivity Gains within the Supply Chain

Regular engagement with the material suppliers will allow them to align with our thinking in terms of what our designs are specifying and also align with the planned expenditure. This will inform them for investment decisions they may make in **new technologies and manufacturing equipment**. We will conduct **Supplier Forums** and invite the appropriate groups to ensure that the relevant suppliers all are party to the same key messages and treatment for all is fair.

Bulk purchasing where there is economic benefit either in terms of cost or time saving will be pursued.

Initiatives regarding materials being available when required which also avoid adding to the expected traffic congestion issue will see value in **coordinated logistics** approach. We will explore opportunities to have centralised depots where the long haul of materials can be undertaken at night, with short haul deliveries and pick up during the day. Pre-approved and tested materials held on consignment at these depots will also reduce cost to delivery. From these 'hubs' other support services such as plant hire depots, workshops etc could operate minimizing downtime for the Delivery Teams.

A combination of investment in new technologies and manufacturing equipment, bulk purchasing and smart logistics should result in a costs being taken out of the manufacturing process and in turn better prices received for materials, whilst the suppliers still maintain their margin and a sustainable business.

4. WHAT WILL WE MEASURE?

4.1 Productivity Categories to be Measured

Our ultimate objective as the SCIRT team is to achieve a steady state of \$40M per month expenditure with \$32-34M of this expenditure delivered as physical works.

SCIRT will measure performance on productivity across 4 separate categories:

- 1) Overhead
- 2) Design
- 3) Delivery (construction)

To ensure continuous improvement, feedback will be given frequently to the groups that are being measured to allow them to monitor their progress.

(Refer Appendix 1 – Summary of Key Productivity Measurements)

4.2 Productivity Metrics

4.2.1 Overheads

This measure will be a simple relation between overhead costs and total SCIRT cost on a monthly basis. This will be measured as a percentage.

Overhead costs will be measured in the following ways:

- a) SCIRT overhead against total cost (aim to optimize at \$40M p.m. output)
- b) Individual Delivery Team overhead against total value of work delivered by that team
- c) Monthly Total Invoiced against Forecast Expenditure (-/+1.5%)

Direct comparisons will be able to be made between Delivery Teams to ensure competitive tension is maintained. However, this measure will need to be read in conjunction with other Delivery Teams measures, such as TOC performance, to ensure a balanced picture of actual performance is represented.

Proposed Owner: Graeme Tapp

4.2.2 Design

Design performance will be measured in the following ways:

- a) Monthly design overhead against design value complete (transferred to TOC)
- b) Value Register total per month
- c) Monthly Total design achieved against forecast (+/- 5%)

Productivity of each Design Team will also be separated to allow comparisons across the team's performance to be made and promote competition.

Proposed Owner: Stephen Wright

4.2.3 Delivery

There are multiple areas in which productivity can be measured on site. The difficulty is ensuring that each measure is consistently captured and no individual element is considered in isolation. We therefore intend to capture the following measures in the first instance to present a balanced picture on productivity by Project and by Delivery Team.

- a) **Productivity Index (Appendix A)** – based on pipe lengths laid by duration based on type, depth and size. Productivity will be measure relative to a 'baseline' measurement for that particular category established in September 2011. Progress in terms of productivity improvement through time will be reflected in the 'Productivity Index'.

Targets will be established as part of the pre-construction requirements as part of the ECI process and will be included in the Design report for each project. On a weekly basis, through the Weekly Achievement Reports, feedback will be given to the TOC team (estimating team) to allow them to adjust the TOC's production rates at appropriate intervals (typically 3- 6 monthly depending on the volume of data).

Weekly On site Targets - productivity targets will be set each week by the respective delivery team, taking into account local variances. These weekly targets will be established by the on-site management to service the targets set as part of the pre-construction requirements.

Project Productivity Review - the same measures will be reviewed at the end of each Project (which will eliminate weekly variances) and this information will be used to inform future TOC's.

- b) **People** - these measures will demonstrate how we can get more from fewer key personnel over time.
 - number of people on site vs expenditure
 - Make up of people on site by trade

- c) **Financial**
 - Monthly expenditure against Forecast expenditure (+/-1.5%)
 - Monthly overheads against total Value of work delivered by \$

Proposed Owners: Sean Walsh/ Matt Thomas

5. PRODUCTIVITY PLAN COMMUNICATION

This Productivity Improvement Plan and associated action plans to be developed as a result of this plan will be communicated to each team by their respective leaders (Commercial, Design and Delivery) by 1 August 2012.

6. APPENDIX 1 - PRODUCTIVITY INDEX – ON SITE PERFORMANCE MEASURE

6.2 Reporting – Why Is Required?

- a. Data for Estimators – average rates – metres per day for different pipe sizes/materials/depths/dewatering circumstances.
- b. KRA / KPI performance
- c. Monitor - and collect data for forecasting
- d. Demonstrate what we are achieving for reporting to OPs

6.3 Data Capture

- i) SCIRT Weekly Achievement Reports
- ii) SCIRT Estimators monthly productivity reporting
- iii) Delivery Team's own systems

There are a number of variables across each project making direct comparison difficult, but not impossible. As each Delivery Team operates under separate home based systems, it has been decided that utilising SCIRT's Weekly Achievement Report with the input coming directly from each individual Project will provide the most accurate and simplest form of capture. An extra column will be added for non-productive days which will provide the Estimating team what they need from the one report.

6.4 MEASURING PRODUCTIVITY (K.P.I.) – Agreed The Following:

In order to establish productivity reporting we will commence with productivity on pipe laying in the first instance. Once we have the system bedded in we will extend the measure to more complex and variable assets such as retaining walls.

- Use Achievement Reports (with extra column).
- Focus on pipe laying only, i.e. the three waters.
- Achievement Reports are weekly.
- Weekly productivities will be the focus of on-site drive, but due to the variability of weekly outputs, monthly reporting of KPI is more appropriate.
- For each project with pipe-laying activity, calculate *average* metres laid per day for that particular diameter, material, depth, asset type and dewatering method.
- Default is 5 day week, but new column allows recording of actual days per week spent on the task.
- Index the performance against the initial TOC productivity rates used in September 2011. This relative measure will enable performance gains to be tracked over time from the start of the Programme of Works (September 2011) through to the end (Sept 2016).
- Relative productivity performance will be measured across each project throughout the duration of the works.
- An average index of productivity will be reported monthly on each of the 3 waters elements i.e. Water, Wastewater, Storm water.

Example:

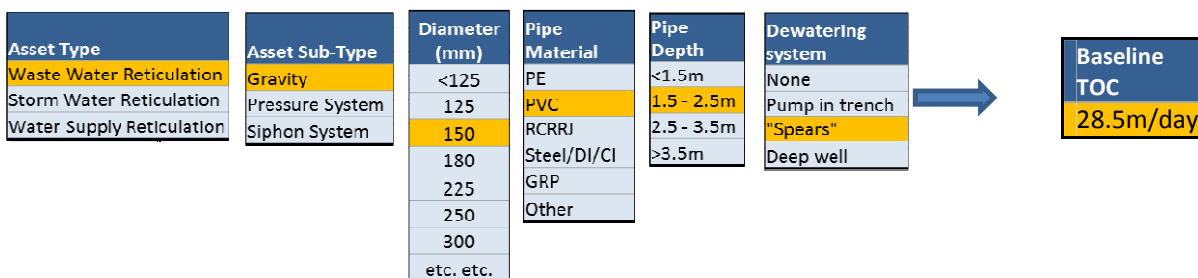
For period Monday 4th June – Sunday 1st July (4 weeks)

Project 10345

Laid 510m of 225mm dia. uPVC gravity wastewater at avg. 2m deep (dewatering with spears):

Date Week Ending	10-Jun	17-Jun	24-Jun	1-Jul	Total (m)
Week	1	2	3	4	
Achievement (linear metres)	10	150	250	100	510
Days worked on this asset	3	5	6	2	16
Comments	Public holiday & snow		Worked on Sat.	Finished on Tue.	
Actual average (m/day)					31.9
TOC Baseline (Sept 2011) *					Baseline m/day (this asset type)
					28.5
Productivity Index					1.12

*Baseline TOCs have been developed to cover the most common combinations of circumstances:



It is not proposed to report separate monthly Productivity Indices for every combination. Instead, it is proposed to report only the *average* monthly Productivity Index (PI) for each of the 3 Waters.

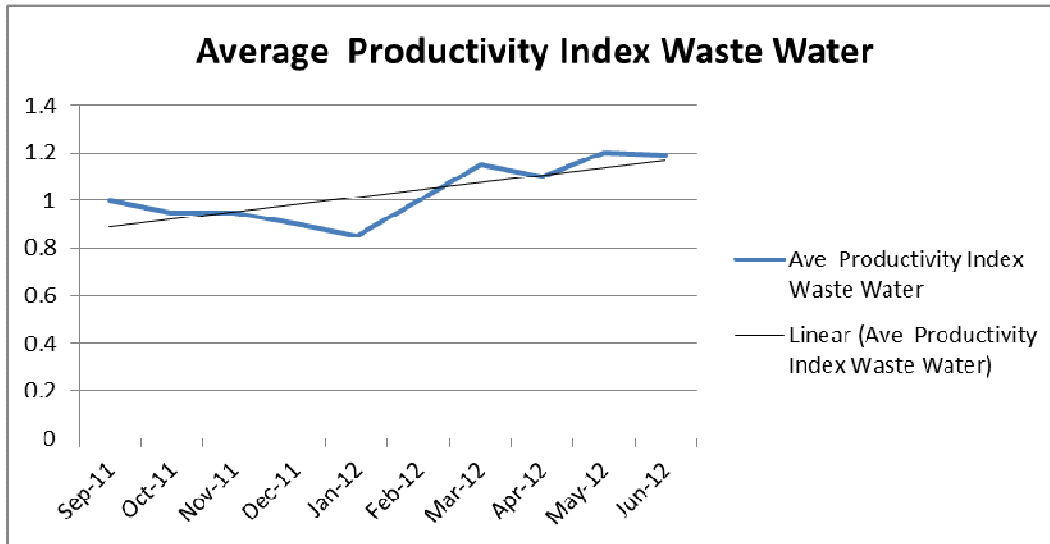
To calculate the average PI for June 2012 for Wastewater, we extract all the wastewater achievement data for that month, calculate the individual PIs and average them:

Month: June 2012	Asset Type: Wastewater	
Project No.	Monthly daily Productivity by Project	PI = Project Performance against respective Baseline
10345	31.9	1.12
10358	35.0	1.28
10449	26.2	1.19
Monthly Productivity Index for Waste Water	31.0	1.19

We can track improvements in the monthly Productivity Index. A graph similar to that shown below would be produced for each of the three waters and updated on a monthly basis.

We can also 'slice and dice' the data for comparisons between Delivery Teams or asset types etc.

The PI values would not be used in isolation but as tool to identify exceptions. The exceptions could be examined against other parameters such as Actual Cost vs. TOC.



6.5 ON-SITE FOCUS – Not Leaving Productivity Gains To Chance

In parallel with the Productivity Index measurement, a simple, on-site productivity programme will be established. This will be project/ crew specific and identify daily, weekly and project targets to which the crews will plot their actual performance against. The form of the programme will utilise the simple 'cricket worm' and track the run rate against target. We will drive this 'culture of productivity' by placing it immediately behind the daily Hazard Assessments requirements of each crew's daily pre-start meetings.