

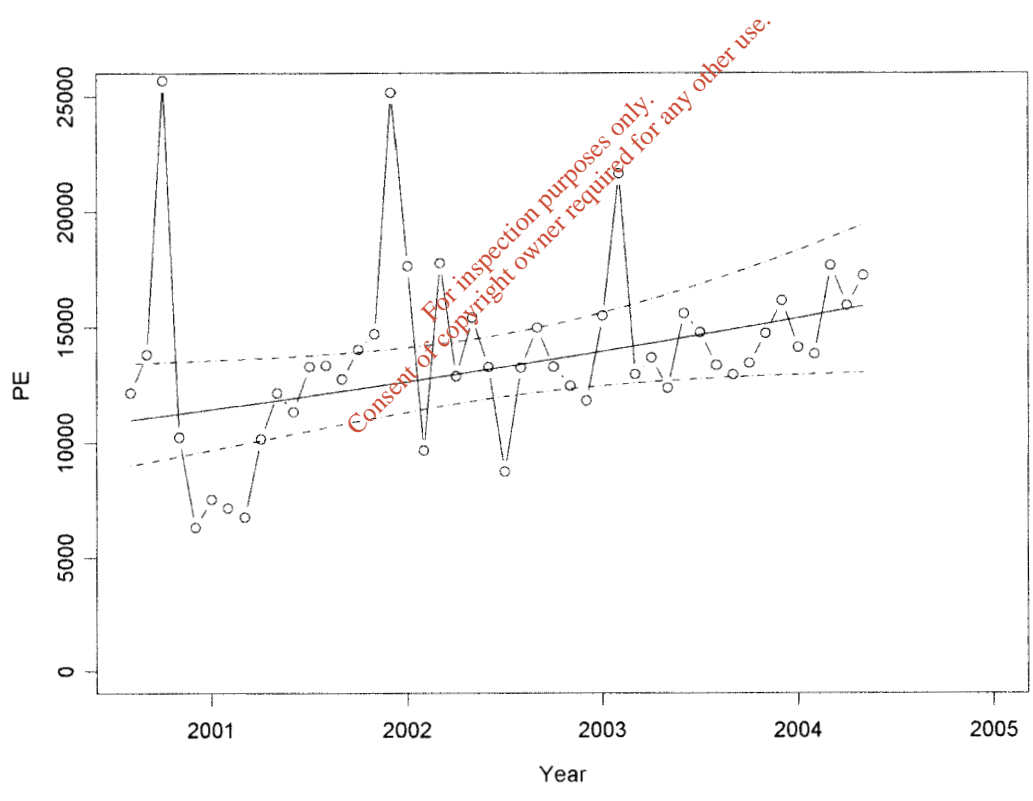
Date: 21st April 2004

Title: Analysis of Midleton WWTP Monthly PE
Author: Joseph Thorley.

In order to quantify the magnitude and significance of the linear increase in the PE, I first log transformed the data to reduce the influence of the three spikes. Question 1 : what is the cause of the three spikes and can we exclude them from the analysis (doing so will increase the significance of the result and narrow the confidence interval around the regression line)? I then fitted a standard regression line (linear model) to the transformed data (which I back transformed to the original scale for viewing and to aid interpretation of the results).

The regression line is shown on the graph as the solid line. The probability of getting the observed increase through time due to chance is slightly less than 1 in a 100 ($p = 0.009$). The confidence we can invest in the regression line is indicated by the dotted lines which represent 95% (simultaneous) confidence intervals, i.e., the probability that the actual relationship lies entirely within these two lines is 95 out of 100.

The actual regression line increase from 11,000 to 16,000 in just under 4 years which is an increase of approximately 12% pa. However the increase you suggested of 20% p.a. lies within the confidence intervals so the data do not exclude this possibility.



(K)

(3)

24th November, 1999.

Mr. Jack Matson,
Divisional Engineer,
Cork County Council,
County Hall,
Cork.

M.C. O'Sullivan & Company Ltd.

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COUNTY ENGINEERS DEPT.
SOUTHERN DIVISION
ROOM 611
25 NOV 1999
CORK COUNTY COUNCIL
COUNTY HALL, CORK

Re: Middleton Main Drainage .

Dear Sir,

The proposed treatment plant has the capacity to treat a flow of 3 DWF from 15,000 p.e. The treatment is divided into three streams each capable of providing treatment for 5,000 p.e. The contract presently under construction is for the construction of two streams, 10,000 p.e.

In the 1993 Preliminary Report the 1993 population was calculated at 8,341 p.e. Between 1993 and 1998 planning permission for 1300 housing units has been granted and of which 500 units have been constructed. Allowing for the same rate of construction for 1999 and 2000 and assuming an occupancy rate of 4 persons/unit results in an additional 2,800 p.e. requiring treatment.

= + 700 houses from 1993 - 2000

Cork County Council has agreed to provide treatment to the effluent from Dawn Meats treatment plant. The E.P.A. discharge license for Dawn Meats plant allows a maximum hourly discharge of 50 m³/hr with a BOD of 60 mg/l. To ensure that the retention time in the Garryduff Treatment Plant is maintained to ensure full denitrification is achieved the volume of the Dawn Meats plant is the critical factor. During the period May 1998 to April 1999, the daily volume of discharge was of the order of 550 m³/day. If this volume was delivered to the Garryduff treatment plant over a 24 hour period the hourly volume entering the treatment plant would be 23 m³/hr, which is equivalent to a population of 594.

the "splendid results" shows full denitrification is occurring.

As result of the increase in population and the discharge from Dawn Meats, delivered over a 24hr period, on commissioning the treatment plant will be required to provide treatment for: -

1993 population equivalent
1994 to 2000 increase in population
Population equivalent from discharge from Dawn Meats
Total population equivalent

= 8,341 }
= 2,800 } 11,141
= 594 }
= 11,735 }
594 / 11,141 = 5.3%

= 150 houses (5.3%)

Also at: Alhurst, Mount Merrion Avenue, Blackrock, Co. Dublin. Tel: 01-283 4499 Fax: 01-283 5676

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P.K. O'Sullivan, K. Power, M.J. O'Sullivan

P.J. Rudden, P. Sheppard, J.V. Healy

"variation order" such as this is a
rare event according to the full needs
- he has done 2 in his life - points
to urgency.

Mr. Jack Matson, Cork County Council

24th November, 1999.

Therefore, the third stream at the Garryduff Treatment Plant is required immediately, I would recommend that the construction of the third stream should be constructed as an extension to John Fleming Construction Ltd.'s contract for the following reasons: -

- The rates in the present contract for this work are extremely competitive and the construction costs of the extra stream would be IR£610,000 (incl. VAT) approximately. If the third stream was to be constructed as a separate contract, starting when the present contract is completed, the corresponding rates would in all probability be significantly higher.
- A second contractor could not enter the site until the present contract is completed. Therefore, the only way of providing adequate treatment capacity in 2000 is to construct the third stream as an extension to John Fleming Construction Ltd.'s contract.
- It must be borne in mind that if the plant was overloaded by 20% or more there would be danger of not complying with the Department of Fisheries discharge licence.

Assuming that from the year 2000 onwards the annual rate of house construction remains at that experienced from 1994 to 1998 the treatment plant at Garryduff, with the three streams constructed (15,000 p.e.), would have adequate capacity until 2007. It should be noted that in the last two years approximately the rate of planning applications for Midleton has increased substantially, as has the size of the proposed developments with one application for 700 houses alone. Therefore, the likely rate of house construction in Midleton will be significantly greater than that experienced to date. The review of the Development Plan for Midleton currently being carried by Cork County Council, in relation to the allowable densities on currently zoned land and the zoning of additional lands for housing, should also examine the impacts on the Garryduff treatment plant.

Exceeded
by an
order of
magnitude?

If you have any queries please contact me.

Yours sincerely

Liam Singleton
LIAM SINGLETON.

LS/DOD.

Our Ref: N:\Workdirs\033(Cork Co Co S)\037(Midleton SS)\LETTERS\LS 24-11-99.doc

Airle Chontae Chorcaí
Cork County Council

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Engineer's Dept. (South)
Fax No. 021-342098

1899 ~ 1999
A Century of Service

Mr. D. Barrett
Asst. County Manager
Floor 15

(5)

CO. MANAGER'S OFFICE
RECEIVED
16 DEC 1999
COUNTY HALL, CORK

15 December, 1999

Re: **Midleton Main Drainage**

I attach report of 24/11/99 from M. C. O'Sullivan, Consulting Engineers.

Our contract, at present under construction, caters for a population equivalent of 10,000.

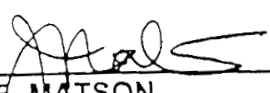
With the advent of Dawn Meats and the large number of houses under construction and proposed, M. C. O'Sullivan detail the 'new' population equivalent at 11,735, and recommend that a third stream of the Garryduff Treatment Plant be proceeded with.

They recommend that the work be proceeded with immediately as an addition to the present contract.

This would effect considerable savings to the Council as well as expediting the procedure.

I recommend that we proceed as suggested.

D.O.E. approval will be required.


J. F. MATSON
DIVISIONAL ENGINEER

Consent of Council for inspection purposes only for any other use.

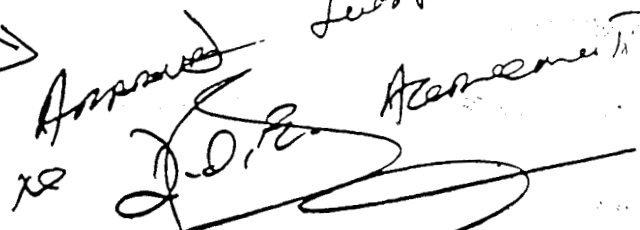
Approved Subject
re D.O.E. Agreement

16/12/99

Table 3.10 Population estimates at full development of the sLAP catchment (April 2006)

| Description | Objective No | SLAP Reference | Area | Housing Density | Household Size | Dwelling Numbers | Population | Hydraulic Load | Total PE | Phase 1 Estimate | | |
|---|---------------|----------------|----------------|-----------------------|----------------|------------------------|------------------|----------------|-----------------|------------------|------------|---------------|
| | | | (Ha) | Houses/ha | Persons /house | | Persons | cu.m/day | | Percentage % | PE units | |
| Residential | | | | | | | | | | | | |
| Existing Residential Area | | | | | | | | | | | | |
| Existing Population according to 2006 Census | | | | | | | 2,782 | 0.225 | 628.0 | 2,782 | 100% | 2,782 |
| Established area primarily Residential (with assumed infill development) | | | 75.670 | 20.00 | 3.15 | 1,513 | 1,985 | 0.225 | 446.7 | 1,985 | 30% | 596 |
| Proposed residential (as per sLAP April 2006) | | | | | | | | | | | | |
| Castlelake Development (Part of) | R-01 | Fig 6.1 | 1.100 | 27.1 | 3.15 | 38 | 120 | 0.225 | 26.9 | 120 | 100% | 120 |
| West End of Bog Road | R-02 | Fig 6.1 | 0.300 | (Part R-01) | 3.15 | (Part R-01) | (Part R-01) | | (Part R-01) | (Part R-01) | 100% | (Part R-01) |
| Castlelake Development (Part of) | R-03 | Fig 6.1 | 11.000 | 41.1 | 3.15 | 1,370 | 4,316 | 0.225 | 971.0 | 4,316 | 75% | 3,237 |
| Castlelake Development (Part of) | R-04 | Fig 6.1 | 22.000 | (Part R-03) | 3.15 | (Part R-03) | (Part R-03) | | (Part R-03) | (Part R-03) | 75% | (Part R-03) |
| East of Station Road | R-05 | Fig 6.1 | 2.100 | 18.1 | 3.15 | 38 | 120 | 0.225 | 26.9 | 120 | 100% | 120 |
| West End of Bog Road | R-06 | Fig 6.1 | 9.500 | 10.5 | 3.15 | 100 | 315 | 0.225 | 70.9 | 315 | 100% | 315 |
| East of Station Road | R-07 | Fig 6.1 | 3.000 | 15.0 | 3.15 | 45 | 142 | 0.225 | 31.9 | 142 | 100% | 142 |
| East of Station Road | R-08 | Fig 6.1 | 0.900 | 25.6 | 3.15 | 23 | 72 | 0.225 | 16.3 | 72 | 100% | 72 |
| East of Fola Rock | R-09 | Fig 6.1 | 9.600 | 26.0 | 3.15 | 250 | 788 | 0.225 | 177.2 | 788 | 100% | 788 |
| Castlelake Development (Part of) | R-10 | Fig 6.1 | 2.800 | 30.0 | 3.15 | 84 | 265 | 0.225 | 59.5 | 265 | 100% | 265 |
| Castlelake Development (Part of) | R-11 | Fig 6.1 | 0.300 | (Part R-03) | 3.15 | (Part R-03) | (Part R-03) | | (Part R-03) | (Part R-03) | 75% | (Part R-03) |
| West of Old Cobh Road | R-12 | Fig 6.1 | 2.600 | 3.8 | 3.15 | 10 | 32 | 0.225 | 7.1 | 32 | 0% | - |
| Major New Residential Nbourhood (N of Railway) | X-01 (Pt.of) | Fig 6.1 | 128.000 | 15.6 | 3.15 | 2,000 | 6,300 | 0.225 | 1,417.5 | 6,300 | 50% | 3,150 |
| Station Quarter (Part of) | X-02 (Pt.of) | TRA 5-4 | 8.600 | 29.1 | 2.55 | 250 | 638 | 0.225 | 143.4 | 638 | 50% | 319 |
| Castlelake Development (Assumed high density housing) | X-04 (Pt.of) | §9.3 | 0.700 | 40.0 | 2.55 | 28 | 71 | 0.225 | 16.1 | 71 | 0% | - |
| Total for Residential Areas | | | 278.170 | | | 5,749 | 17,944 | | | | 66% | 11,904 |
| Educational, Institutional & Civic | | | | | | | | | | | | |
| Existing Schools | | | 3.6 | | 974 | 45 | 43,830 | | 43.8 | 195 | 100% | 195 |
| Provision for Primary School - Castle Lake (Pt. of) | E-01 | | 2.9 | | | | | | | | | |
| Provision for Secondary School - X-01 (Pt. of) | X-01 (Pt. of) | §9.2 | N/A | | | | | | | | | |
| Estimated Future School Population | | | | | 4,549 | 45 | 204,664 | | 204.7 | 910 | 66% | 603 |
| Note: Increase in school population is proportional to the growth of the general population | | | | | | | | | | | | |
| Total for Educational, Institutional & Civic | | | 6.5 | | 5,523 | | 246,514 | | | | | 1,105 |
| Industrial & Enterprise Areas | | | | | | | | | | | | |
| Existing Industrial lands (Not fully developed) | | | 73.5 | Light | | 28.00 | 2,058 | | 2,058.4 | 9,149 | 100% | 9,149 |
| Aringrove North (Carhoo) | I-01 | §9.5 | 19.8 | Light w/house | | 28.00 | 550 | | 554.4 | 2,464 | 50% | 1,232 |
| Aringrove South (Carhoo) | I-02 | §9.5 | 10.8 | Light w/house | | 28.00 | 1,344 | | 302.4 | 1,344 | 75% | 1,008 |
| IDA North | I-03 | §9.5 | 43.6 | Light | | 28.00 | 1,221 | | 1,220.8 | 5,426 | 100% | 5,426 |
| Gorlagousla | I-04 | §9.5 | 32.2 | Light | | 28.00 | 902 | | 4,007 | 4,007 | 75% | 3,005 |
| Cobh Cross | I-05 | §9.5 | 5.8 | Mixed | | 28.00 | 162 | | 722 | 722 | 100% | 722 |
| Cobh Cross (GCC Land) | I-06 | §9.5 | 2.7 | Office | | 28.00 | 27 | | 120 | 120 | 100% | 120 |
| Cobh Cross (East) | I-07 | §9.5 | 6.6 | Office | | 28.00 | 66 | | 293 | 293 | 100% | 293 |
| Old Cobh Road (South of N25) | I-08 | §9.5 | 2.2 | Light w/house | | 28.00 | 62 | | 274 | 274 | 100% | 274 |
| Ballyadam (AMGEN Site) | I-09 | §9.5 | 56.2 | Med./Stand | | 28.00 | 3,147 | | 13,988 | 13,988 | 50% | 6,994 |
| Tullagreen (Youghal Carpet) | X-03 | §9.3 | 12.6 | Mixed | | 28.00 | 353 | | 352.8 | 1,568 | 100% | 1,568 |
| Total for Industrial & Enterprise Areas | | | 263.9 | | | | 8,854.648 | | | | | 39,354 |
| Town / Neighbourhood Centre | | | | | | | | | | | | |
| Existing - Primarily Town / Neighbourhood Centres | | | 4.0 | | | 10 | 39.8 | | 39.8 | 177 | 100% | 177 |
| Proposed Town / Neighbourhood Centres. | | | | | | | | | | | | |
| Castlelake Development (Part of) | T-01 | | 3.5 | | | 10 | 35.0 | | 35.0 | 156 | 100% | 156 |
| South Of Main Street | T-02 | | 2.7 | | | 10 | 27.0 | | 120 | 60 | 50% | 30 |
| South Of Main Street | T-03 | | 1.2 | | | 10 | 12.0 | | 53 | 27 | 50% | 13.5 |
| Station Quarter (Tranin Stn Assumed) | X-02 (Pt.of) | TRA 5-4 | N/A | Assumed 0.1Ha | | 10 | 1.0 | | 4 | 4 | 100% | 4 |
| Station Quarter (Convenience & Comparison Store) | X-02 (Pt.of) | TRA 5-4 | N/A | 500+200sq.m | | 10 | 0.7 | | 3 | 3 | 100% | 3 |
| Station Road (Pt. of Castlelake site) | X-05 | | 0.9 | | | 10 | 9.0 | | 40 | 40 | 0% | - |
| Total for Town / Neighbourhood Centre | | | 12.3 | | | | 124.5 | | | | | 553 |
| Existing Utilities / Infrastructure | | | | | | | | | | | | |
| Bord Gais Pumping station | | | 0.5 | | | | | | 0.0 | | 100% | 0 |
| Carrigrohilly WWTP | | | 0.8 | | | | | | 0.0 | | 100% | 0 |
| ESB Substation | | | 0.4 | | | | | | 0.0 | | 100% | 0 |
| Roads, Railway & other areas not designated a zoning type. | | | 22.6 | | | | | | 0.0 | | 100% | 0 |
| Total for Existing Utilities / Infrastructure | | | 24.3 | | | | | | | | | 0 |
| Existing Commercial | | | | | | | | | | | | |
| Petrol Station | | | 0.2 | | | 10 | 2 | | 2.2 | 10 | 100% | 10 |
| Total for Existing Commercial | | | 0.2 | | | | | | | | | 10 |
| Open Spaces / Sports Recreation / Amenity | | | | | | | | | | | | |
| Existing - Open Spaces / Sports Recreation | | | 15.78 | | | | | | 0.0 | | 100% | 0 |
| GAA pitch | | | 6.19 | | | | | | 0.0 | | 100% | 0 |
| Proposed Open Space, Sports, Recreation & Amenity | | | | | | | | | | | | |
| Linear Park | O-01 | §9.8 | 1.50 | | | | | | 0.0 | | 100% | 0 |
| Linear Park including lagoon | O-02 | §9.8 | 3.90 | | | | | | 0.0 | | 100% | 0 |
| Possible Games Pitches (Bog Road) | O-03 | §9.8 | 4.60 | | | | | | 0.0 | | 100% | 0 |
| Active Open Space | O-04 | §9.8 | 1.50 | | | | | | 0.0 | | 100% | 0 |
| Recreation, Sport Facilities HOU 6-3 | X-01 (Pt. of) | §6.4 | 20.00 | | | | | | 0.0 | | 100% | 0 |
| Total PE Based on sLAP (April 2006) | | | 53.47 | | | | | | 13,267.2 | 58,965 | | 42,929 |
| Additional Loads on WWTP | | | | | | | | | | | | |
| Leachate from Rossmore | | | | | 27,500 | Leachate BOD assumed = | 200 | | 75.3 | 251 | 100% | 251 |
| Additional Sludges from other sources | | | | | 1,800 | Sludge BOD assumed = | 1,600 | | 4.9 | 132 | 100% | 132 |
| Fola Golf Course | | | | | 3,000 | BOD load assumed = | 240 | | 8.2 | 33 | 100% | 33 |
| Total PE | | | | | | | | | 13,356 | 59,381 | | 43,344 |
| Total Area | | | = | 640.8 hectares | | | | | | | | |